



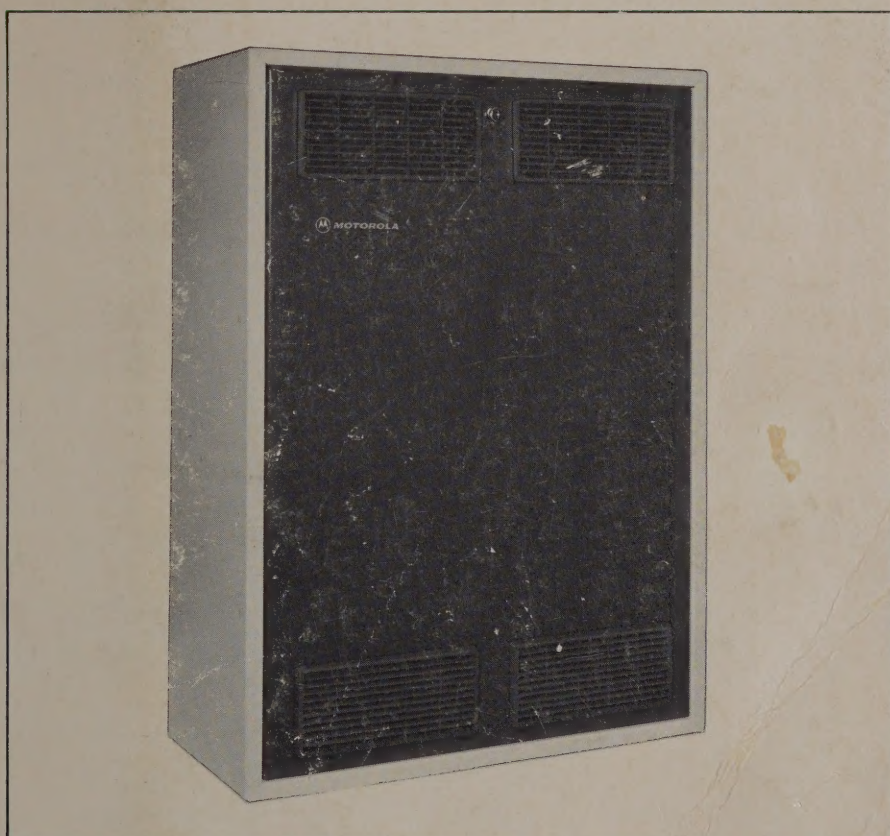
PAC-com-

“MICOR”[®]
“COMPA-STATION”[®]

Base Radio
Remote Control

132-174 MHz

68P81013E65-L



THIS INSTRUCTION MANUAL MUST BE USED WITH
“CONTROL AND APPLICATIONS”
INSTRUCTION MANUAL 68P81025E60

**COMMERCIAL WARRANTY
(STANDARD)**

Motorola radio communications products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, (except for crystals and channel elements which are warranted for a period of ten (10) years) from the date of shipment. Parts, including crystals and channel elements, will be replaced free of charge for the full warranty period but the labor to replace defective parts will only be provided for One Hundred-Twenty (120) days from the date of shipment. Thereafter purchaser must pay for the labor involved in repairing the product or replacing the parts at the prevailing rates together with any transportation charges to or from the place where warranty service is provided. This express warranty is extended by Motorola Communications and Electronics, Inc., 1301 E. Algonquin Road, Schaumburg, Illinois 60196, to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED WHICH ARE SPECIFICALLY EXCLUDED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW.

In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown, Motorola, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Motorola shall be the full extent of Motorola's liability hereunder.

This warranty is void if:

- a. the product is used in other than its normal and customary manner;
- b. the product has been subject to misuse, accident, neglect or damage;
- c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

This warranty extends only to individual products, batteries are excluded, but carry their own separate limited warranty. Because each radio system is unique, Motorola disclaims liability for range, coverage, or operation of the system as a whole under this warranty except by a separate written agreement signed by an officer of Motorola.

Non-Motorola manufactured products are excluded from this warranty, but subject to the warranty provided by their manufacturers, a copy of which will be supplied to you on specific written request.

In order to obtain performance of this warranty, purchaser must contact its Motorola salesperson or Motorola at the address first above shown, attention Quality Assurance Department.

This warranty applies only within the United States.

EPS-27734-O



AVAILABLE BACKGROUND REFERENCE PUBLICATIONS

Five reference publications are available to provide background information needed to service some of the newer Motorola products more effectively. The information in these publications is not duplicated in our instruction manuals. To obtain your free copy, check the ones you want and return this self-mailer to us. (NOTE: One copy of each publication has already been distributed to Motorola Service Shops (MSS's) and field technical representatives (FTR's).

Check item desired:

- | | |
|--|-------------|
| <input type="checkbox"/> Basic Logic Circuit Guide
Describes the basic logic circuits used in Motorola Communications digital equipment and the logic notational scheme used in our instruction manuals. | 68P81105E88 |
| <input type="checkbox"/> "Digital Private-Line" Binary-Coded Squelch
Contains fundamentals of "Digital Private-Line" system operation, circuit operation and servicing techniques. | 68P81106E83 |
| <input type="checkbox"/> Safe Handling of CMOS Integrated Circuit Devices
Describes special handling techniques needed to prevent irreparable damage from static charges encountered with normal handling of CMOS devices. | 68P81106E84 |
| <input type="checkbox"/> Reducing Noise Interference in Mobile Two-Way Radio Installations
Defines the major sources of noise encountered in a mobile radio installation and suggests methods of remedying them. | 68P81109E33 |
| <input type="checkbox"/> Anti-Skid Braking Precautions
Provides installation suggestions and a detailed checkout procedure for installation of mobile radios in vehicles with anti-skid braking systems. | 68P81109E34 |

Return Address Label

Send To _____
Company _____
Address _____
City _____
State _____ Zip _____

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**NOTICE: Postal Regulations Prohibit Staples.
Please use tape.**

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carefully so
bar pattern at
top center of
envelope can be
read by post-
optical scan

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Fold



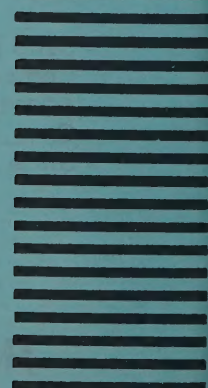
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MOTOROLA, INC.
NATIONAL ACCOUNTS PARTS DEPT.
1313 E. Algonquin Road
Schaumburg, Illinois 60196



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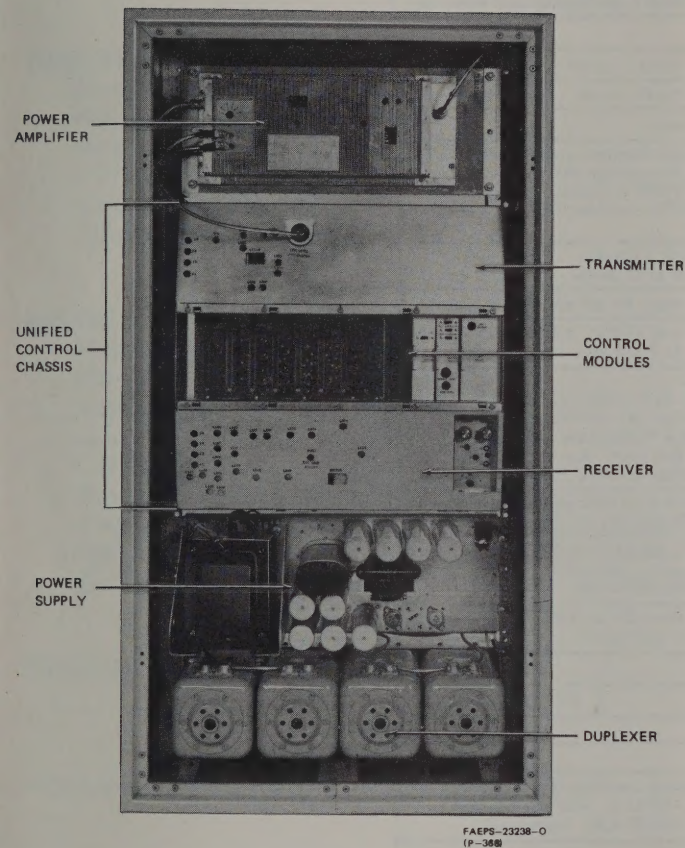


MOTOROLA INC.

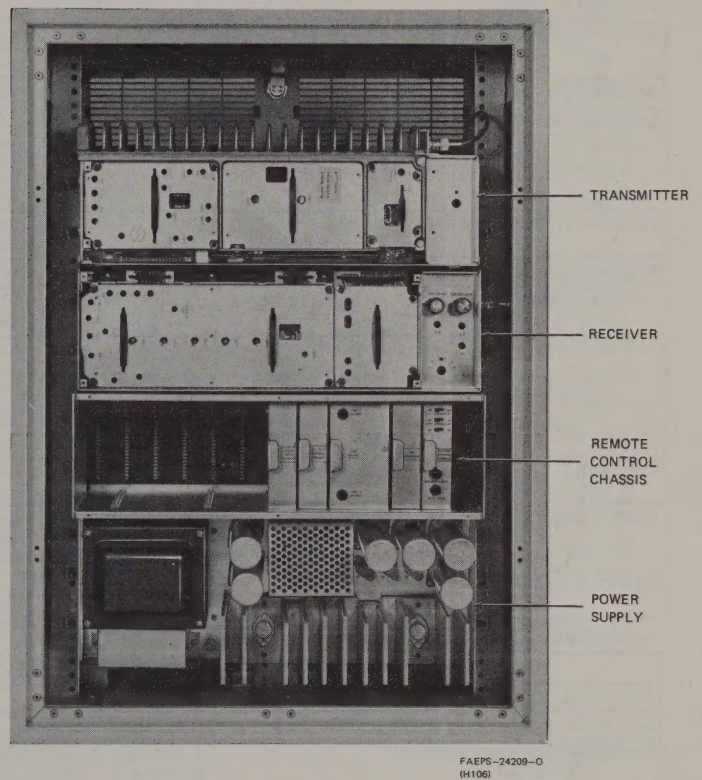
Communications
Group

"MICOR" "COMPA-STATION" BASE & REPEATER RADIO

132-174 MHz
60, 90, 100 & 110 W RF POWER



Typical Continuous Duty Station



Typical Intermittent Duty Station

SPECIFICATIONS GENERAL

MODEL SERIES		C53RCB, C53RTB	C63RCB, C63RTB	C73RCB, C73RTB
RF POWER OUTPUT (WATTS)		60	90	RCB = 100 RTB = 110
120V AC (+20%, -40%), 60 Hz INPUT POWER REQUIREMENTS (WATTS)		120	180	200
INPUT AC CURRENT	STANDBY	0.63		
REQUIREMENTS (AMPS)	TRANSMIT	3.15	4.4	5.4a
FREQUENCY RANGE (MHz)		150.8-174.0	132-174	
NO. OF FREQUENCIES		Up to 4 frequencies		
CABINET DIMENSIONS (INCHES)	INDOOR CABINET (RTB MODELS ONLY)		22 wide x 30-1/4 high x 10 deep	
	INDOOR CABINET (RCB MODELS ONLY)		22 wide x 41 high x 10 deep	
	OUTDOOR CABINET		22 wide x 46 high x 20 deep	
APPROX. SHIPPING WEIGHT (LBS)	INDOOR REMOTE CONTROL	RCB MODELS	190	
		RTB MODELS	150	
	OUTDOOR REMOTE CONTROL	RCB MODELS	180	
		RTB MODELS	130	
METERING		Optional internal mounted meter used to mea- sure all essential circuits for tuning and checking.		

TRANSMITTER

RF POWER OUTPUT	RTB MODELS	60W, 90W, 110W
	RCB MODELS	60W, 90W, 100W
OUTPUT IMPEDANCE		50 ohms
OSCILLATOR FREQUENCY STABILITY		Channel element maintains oscillator frequency within 0.0005% ($\pm 0.0002\%$ optional) from -30°C to $+60^{\circ}\text{C}$ ambient ($+25^{\circ}\text{C}$ reference)
TRANSMITTER SIDE BAND NOISE		90 dB @ $\pm 30\text{kHz}$ 105 dB @ $\pm 1\text{ MHz}$
SPURIOUS & HARMONICS		More than 85 dB below carrier
MODULATION		15F2 and 16F3: $\pm 5\text{ kHz}$ for 100% at 1000 Hz
AUDIO SENSITIVITY		Local: 0.165 volt $\pm 3\text{dB}$ for 60% maximum deviation at 1000 Hz. Remote Telephone Line: -20 dBm max. for 60% maximum deviation at 1000 Hz
FM NOISE		55 dB below 60% system deviation at 1000 Hz
AUDIO RESPONSE		+1, -3 dB from 6 dB/octave pre-emphasis, 300-3000 Hz, referenced to 1000 Hz
AUDIO DISTORTION		Less than 2% at 1000 Hz; 60% system deviation

RECEIVER

		WITHOUT PREAMPL	WITH PREAMPL
CHANNEL SPACING		30 kHz	
EIA MODULATION ACCEPTANCE		$\pm 7\text{ kHz}$, minimum	
OSCILLATOR FREQUENCY STABILITY		Channel element maintains oscillator frequency within $\pm 0.0005\%$ from -30°C to $+60^{\circ}\text{C}$ ambient ($+25^{\circ}\text{C}$ reference) $\pm 0.0002\%$ AFC (optional)	
INPUT IMPEDANCE		50 ohms	
SENSITIVITY	20 dB QUIETING	Less than 0.5 μV	Less than 0.25 μV
	EIA SINAD	Less than 0.35 μV	Less than 0.175 μV
SELECTIVITY (EIA SINAD)		-100 dB at $\pm 30\text{ kHz}$	-95 dB at $\pm 30\text{ kHz}$
INTERMODULATION (EIA SINAD)		-80 dB	-75 dB
SPURIOUS & IMAGE REFLECTION		100 dB, minimum / 90 dB (2-Receiver Stations Only)	95 dB, minimum / 85 dB (2-Receiver Stations Only)
SQUELCH SENSITIVITY	CARRIER SQUELCH (ADJUSTABLE)	0.20 μV or less at threshold	0.10 μV or less at threshold
	TONE-CODED SQUELCH (FIXED)	0.20 μV or less	0.10 μV or less
AUDIO (TELEPHONE LINE)	OUTPUT	$+18\text{ dBm}$ at 600 ohms	
	RESPONSE	$+1, -3\text{ dB}$	
	DISTORTION	3% at 1000 Hz	
	HUM & NOISE	-55 dB	
	LOCAL SPEAKER	10 watts at 8 ohms output available	

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FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 900 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area and district service managers and district representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender"® and "Vibrasponder"® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, code plugs, "Vibrasender" and "Vibrasponder" resonant reeds should specify type number and frequency, and should identify the owner/operator of the communications system in which these items are to be used.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics
Inc.
Communications Group Parts Dept.
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7322
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8600
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road,
Parma, Ohio 44130
Phone: 216-267-2210
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-447-4000
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
P.O. Box 85036
San Diego, California 92138
Phone: 714-578-2222
TWX: 910-335-1634

GULF STATES AREA PARTS
8550 Katy Freeway
Suite 128
Houston, Texas 77024
Phone: 713-932-8955

SOUTHWESTERN AREA PARTS
P.O. Box 34290
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-241-2151
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
P.O. Box 368
Decatur, Georgia 30031
Phone: 504-981-9800
TWX: 810-766-0876

5.3 CANADIAN ORDERS

**CANADIAN MOTOROLA ELECTRONICS
COMPANY**
National Parts Department
3125 Steeles Avenue,
East Willowdale, Ontario
Phone: 416-499-1441
TWX: 610-492-2713
Telex: 02-29944LD

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

**MOTOROLA, INC. OR MOTOROLA
AMERICAS, INC.**
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443 or 722424
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS AND RE- NANT REED ORDERS

ALL MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131

MODEL	DESCRIPTION
★ TLD2150B	POWER AMPLIFIER, 110 WATT
★ TLD2080A	EXCITER-FILTER (132-174 MHz)
TLD5960A	POWER CONTROL BOARD (80/110 WATT)
KXN1019B	CHANNEL ELEMENT, TRANSMITTER
	RECEIVER
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1865A	SECOND RECEIVER
TLD8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
K1005A	CHANNEL ELEMENT, RECEIVER
KXN1022A	CHANNEL ELEMENT, RECEIVER (FOR 2ND RCVR SHIFTED I-F)
	MISCELLANEOUS
TRN8686A	CARD PULLER
TLN4295A	ANTENNA SWITCH

CODE:

• = ONE ITEM SUPPLIED.

2 = TWO ITEMS SUPPLIED.

= TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE I-F OF THE SECOND RECEIVER IS SHIFTED.

INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

3 RTB - 1105E

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL

0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)

1 = CARRIER SQUELCH
3 = "PRIVATE-LINE" TONE-CODED SQUELCH

6 = 90 W RF OUTPUT
7 = 110 W RF OUTPUT

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics
Inc.

Communications Group Parts Dept.

1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196

Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS

1170 Chess Drive, Foster City,
San Mateo, California 94404

Phone: 415-349-3111

TWX: 910-375-3877

MIDWEST AREA PARTS

1313 E. Algonquin Road
Schaumburg, Ill. 60196

Phone: 312-576-7322

TWX: 910-693-0869

MID-ATLANTIC AREA PARTS

7230 Parkway Drive
Hanover, Maryland 20176

Phone: 301-796-8600

TWX: 710-862-1941

EAST CENTRAL AREA PARTS

12995 Snow Road,
Parma, Ohio 44130

Phone: 216-267-2210

TWX: 810-421-8845

EASTERN AREA PARTS

85 Harristown Road,
Glen Rock, New Jersey 07452

Phone: 201-447-4000

TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS

P.O. Box 85036
San Diego, California 92138

Phone: 714-578-2222

TWX: 910-335-1634

GULF STATES AREA PARTS

8550 Katy Freeway
Suite 128

Houston, Texas 77024

Phone: 713-932-8955

SOUTHWESTERN AREA PARTS

P.O. Box 34290

3320 Belt Line Road,
Dallas, Texas 75234

Phone: 214-241-2151

TWX: 910-860-5505

SOUTHEASTERN AREA PARTS

P.O. Box 368

Decatur, Georgia 30031

Phone: 504-981-9800

TWX: 810-766-0876

5.3 CANADIAN ORDERS

CANADIAN MOTOROLA ELECTRONICS COMPANY

National Parts Department

3125 Steeles Avenue,
East Willowdale, Ontario

Phone: 416-499-1441

TWX: 610-492-2713

Telex: 02-29944LD

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC. OR MOTOROLA AMERICAS, INC.

International Parts Dept.

1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.

Phone: 312-576-6492

TWX: 910-693-0869

Telex: 722443 or 722424

Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS AND RE- NANT REED ORDERS

ALL MAIL ORDERS

Motorola, Inc.

Component Products Sales & Service

P.O. Box 66191

O'Hare International Airport

Chicago, Ill. 60666

CORRESPONDENCE

Motorola, Inc.

Component Products Sales & Service

2553 N. Edgington Street

Franklin Park, Illinois 60131

MODEL	DESCRIPTION
★ TLD2150B	POWER AMPLIFIER, 110 WATT
★ TLD2080A	EXCITER-FILTER (132-174 MHz)
TLD5980A	POWER CONTROL BOARD (80/110 WATT)
KXN1019B	CHANNEL ELEMENT, TRANSMITTER
	RECEIVER
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1865A	SECOND RECEIVER
TLD8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
K1005A	CHANNEL ELEMENT, RECEIVER
KXN1022A	CHANNEL ELEMENT, RECEIVER (FOR 2ND RCVR SHIFTED I-F)
	MISCELLANEOUS
TRN8888A	CARD PULLER
TLN4295A	ANTENNA SWITCH
THN6141A	CABINET, INDOOR (30")
THN6142A	CABINET, INDOOR (41")
TPN1151A	POWER SUPPLY
★ TFD6100A	HARMONIC FILTER (132-174 MHz)
TKN6936A	RF CABLE KIT, TRANSMITTER
TKN6569A	RF CABLE, TRANSMITTER
TRN6976A	HARDWARE KIT, 1-RECEIVER
TLN5654A	HARDWARE KIT, PL DECODER
TRN6977A	HARDWARE KIT, 2-RECEIVER
TRN6188A	HARDWARE KIT, PL ENCODER
★ TLD2190A	HARDWARE KIT, PA (132-174 MHz)
	"PRIVATE-LINE"
TLN5731A	PL ENCODER
TRN6002A	PL ENCODER
KLN6210A	SENDER
TLN8381A	"VIBRASPONDER" RESONANT REED
	REMOTE CHASSIS
TCN1223A	UNIFIED CONTROL CHASSIS
TLN1245B	GUARD TONE DECODER MODULE
TLN1245A	C2-R2 TONE CONTROL MODULE
TLN4635B	STATION CONTROL MODULE
TLN4638A	F1-PL TONE CONTROL MODULE
TLN4658A	F1 TONE CONTROL MODULE
TLN4659A	F1-PL DC TRANSFER MODULE
TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
TLN4661A	F1-CS DC TRANSFER MODULE
TLN4663A	C2-R2 DC TRANSFER MODULE
TLN4665A	F2 TONE CONTROL MODULE
TLN4669B	LINE DRIVER MODULE / 2-WIRE 1-RECEIVER
TLN4670B	LINE DRIVER MODULE / 2-WIRE 2-RECEIVER

C63/73 RTB "E" SUFFIX MODELS

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS-INTERMITTENT DUTY

CARRIER SQUELCH AND "PRIVATE-LINE"

TONE-CODED SQUELCH

132-174 MHz

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs-ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGN.
C63RTB-1105E	90	CARRIER	T1-R1	DC	CC3182
C63RTB-1106E	90	CARRIER	T1-R1	TONE	CC3182
C63RTB-1115E	90	CARRIER	T2-R1	DC	CC3182
C63RTB-1116E	90	CARRIER	T2-R1	TONE	CC3182
C63RTB-1125E	90	CARRIER	T2-R2	DC	CC3182
C63RTB-1126E	90	CARRIER	T2-R2	TONE	CC3182
C63RTB-1145E	90	CARRIER	T2-2R	DC	CC3182
C63RTB-1146E	90	CARRIER	T2-2R	TONE	CC3182
C63RTB-3105E	90	PL	T1-R1	DC	CC3182
C63RTB-3106E	90	PL	T1-R1	TONE	CC3182
C63RTB-3115E	90	PL	T2-R1	DC	CC3182
C63RTB-3116E	90	PL	T2-R1	TONE	CC3182
C63RTB-3125E	90	PL	T2-R2	DC	CC3182
C63RTB-3126E	90	PL	T2-R2	TONE	CC3182
C63RTB-3145E	90	PL	T2-2R	DC	CC3182
C63RTB-3146E	90	PL	T2-2R	TONE	CC3182
C73RTB-1105E	110	CARRIER	T1-R1	DC	CC3183
C73RTB-1106E	110	CARRIER	T1-R1	TONE	CC3183
C73RTB-1115E	110	CARRIER	T2-R1	DC	CC3183
C73RTB-1116E	110	CARRIER	T2-R1	TONE	CC3183
C73RTB-1125E	110	CARRIER	T2-R2	DC	CC3183
C73RTB-1126E	110	CARRIER	T2-R2	TONE	CC3183
C73RTB-1145E	110	CARRIER	T2-2R	DC	CC3183
C73RTB-1146E	110	CARRIER	T2-2R	TONE	CC3183
C73RTB-3105E	110	PL	T1-R1	DC	CC3183
C73RTB-3106E	110	PL	T1-R1	TONE	CC3183
C73RTB-3115E	110	PL	T2-R1	DC	CC3183
C73RTB-3116E	110	PL	T2-R1	TONE	CC3183
C73RTB-3125E	110	PL	T2-R2	DC	CC3183
C73RTB-3126E	110	PL	T2-R2	TONE	CC3183
C73RTB-3145E	110	PL	T2-2R	DC	CC3183
C73RTB-3146E	110	PL	T2-2R	TONE	CC3183

CODE:

● = ONE ITEM SUPPLIED.

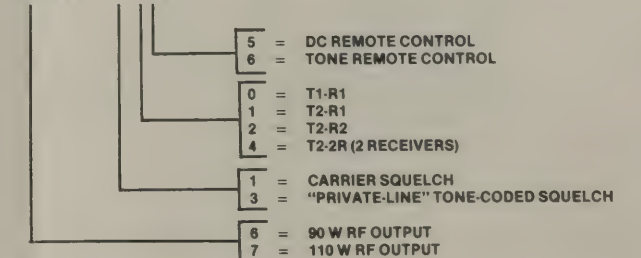
2 = TWO ITEMS SUPPLIED.

= TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE I-F OF THE SECOND RECEIVER IS SHIFTED.

★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES
NOTE
STATION MODELS ARE NOT AVAILABLE FOR ALL
POSSIBLE LETTER AND NUMBER COMBINATIONS.

C63RTB-1105E



73 RTB "C" SUFFIX MODELS

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

E STATIONS — INTERMITTENT DUTY

PRIVATE-LINE" BINARY CODED SQUELCH

132-174 MHz

F PUT VER (TS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS-ONE	CONTROL TYPE	FCC LICENSE DESIGN.
		FREQ. EACH		
0	DPL	T1-R1	DC	CC3182
0	DPL	T1-R1	TONE	CC3182
0	DPL	T2-R1	DC	CC3182
0	DPL	T2-R1	TONE	CC3182
0	DPL	T2-R2	DC	CC3182
0	DPL	T2-R2	TONE	CC3182
0	DPL	T2-2R	DC	CC3182
0	DPL	T2-2R	TONE	CC3182
0	DPL	T1-R1	DC	CC3183
0	DPL	T1-R1	TONE	CC3183
0	DPL	T2-R1	DC	CC3183
0	DPL	T2-R1	TONE	CC3183
0	DPL	T2-R2	DC	CC3183
0	DPL	T2-R2	TONE	CC3183
0	DPL	T2-2R	DC	CC3183
0	DPL	T2-2R	TONE	CC3183

EPS-30278-0

CODE:

● = ONE ITEM SUPPLIED.

2 = TWO ITEMS SUPPLIED.

✓ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE I-F OF THE SECOND RECEIVER IS SHIFTED.

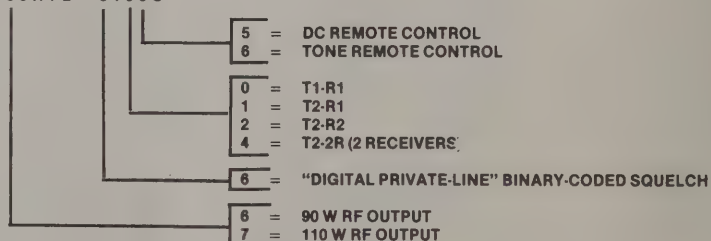
★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C 63 RTB — 6105 C



RTB "D" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-INTERMITTENT DUTY
CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH
132-174 MHz

CODE:

☒ = ONE ITEM SUPPLIED

☒ = TWO ITEMS SUPPLIED

☐ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER
FREQS. ARE SEPARATED BY 11.7 MHz #30 KHz (OR A SUB-MULTIPLE
THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST
RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RE-
CEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.
* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON
CARRIER FREQUENCY.

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RECEIVER
RECEIVER

MODEL	DESCRIPTION
TRANSMITTER	
★ TLD2150B	POWER AMPLIFIER, 110 WATT
★ TLD2060A	EXCITER-FILTER (132-174 MHz)
TLD5960A	POWER CONTROL BOARD (80/110 WATT)
KXN1019B	CHANNEL ELEMENT, TRANSMITTER
RECEIVER	
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1865A	SECOND RECEIVER
TLD8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
K1005A	CHANNEL ELEMENT, RECEIVER
KXN1022A	CHANNEL ELEMENT, RECEIVER (FOR 2ND RCVR SHIFTED I-F)
MISCELLANEOUS	
TRN6686A	CARD PULLER
TLN4295A	ANTENNA SWITCH
THN6141A	CABINET, INDOOR (30")
THN6142A	CABINET, INDOOR (41")
TPN1151A	POWER SUPPLY
★ TFD6100A	HARMONIC FILTER (132-174 MHz)
TKN6936A	RF CABLE KIT, TRANSMITTER
TKN6569A	RF CABLE TRANSMITTER
TRN6976A	HARDWARE KIT, 1-RECEIVER
TLN5654A	HARDWARE KIT, PL DECODER
TRN6977A	HARDWARE KIT, 2-RECEIVER
TRN6188A	HARDWARE KIT, PL ENCODER
★ TLD2190A	HARDWARE KIT, PA (132-174 MHz)
"DIGITAL PRIVATE-LINE"	
TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER
TLN5729A	"DIGITAL PRIVATE-LINE" DECODER
TRN6005A	CODE PLUG
REMOTE CONTROL	
TCN1223A	UNIFIED CONTROL CHASSIS
TLN1245B	GUARD TONE DECODER MODULE
TLN1248A	C2-R2 TONE CONTROL MODULE
TLN4635B	STATION CONTROL MODULE
TLN4638A	F1-PL TONE CONTROL MODULE
TLN4658A	F1 TONE CONTROL MODULE
TLN4659A	F1-PL DC TRANSFER MODULE
TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
TLN4661A	F1-CS DC TRANSFER MODULE
TLN4663A	C2-R2 DC TRANSFER MODULE
TLN4665A	F2 TONE CONTROL MODULE
TLN4669B	LINE DRIVER MODULE / 2-WIRE 1-RECEIVER
TLN4670B	LINE DRIVER MODULE / 2-WIRE 2-RECEIVER

C63/73 RTB "C" SUFFIX MODELS

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS — INTERMITTENT DUTY

"DIGITAL PRIVATE-LINE" BINARY CODED SQUELCH

132-174 MHz

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS.	CONTROL TYPE	FCC LICENSE DESIGN.
			2R = TWO RCVRS-ONE FREQ. EACH		
C63RTB-6105C	90	DPL	T1-R1	DC	CC3182
C63RTB-6106C	90	DPL	T1-R1	TONE	CC3182
C63RTB-6115C	90	DPL	T2-R1	DC	CC3182
C63RTB-6116C	90	DPL	T2-R1	TONE	CC3182
C63RTB-6125C	90	DPL	T2-R2	DC	CC3182
C63RTB-6126C	90	DPL	T2-R2	TONE	CC3182
C63RTB-6145C	90	DPL	T2-2R	DC	CC3182
C63RTB-6146C	90	DPL	T2-2R	TONE	CC3182
C73RTB-6105C	110	DPL	T1-R1	DC	CC3183
C73RTB-6106C	110	DPL	T1-R1	TONE	CC3183
C73RTB-6115C	110	DPL	T2-R1	DC	CC3183
C73RTB-6116C	110	DPL	T2-R1	TONE	CC3183
C73RTB-6125C	110	DPL	T2-R2	DC	CC3183
C73RTB-6126C	110	DPL	T2-R2	TONE	CC3183
C73RTB-6145C	110	DPL	T2-2R	DC	CC3183
C73RTB-6146C	110	DPL	T2-2R	TONE	CC3183

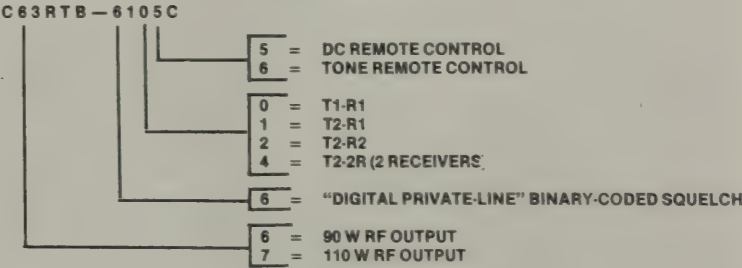
CODE:

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★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

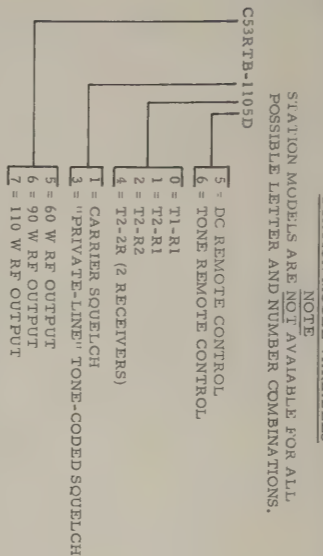
STATION MODEL VARIABLES
NOTE
STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.



RTB "D" SUFFIX MODELS
MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-INTERMITTENT DUTY
CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH
132-174 MHz

CODE:
X = ONE ITEM SUPPLIED
2 = TWO ITEMS SUPPLIED
O = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER
FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE
THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST
RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RE-
CEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.
* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON
CARRIER FREQUENCY.



STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGN.	MODEL	DESCRIPTION
C63RTB-105D	60	CARRIER	T1-R1	DC	CG3181	X	*TLD2160A
C63RTB-106D	80	CARRIER	T1-R1	DC	CG3181	X	*TLD2150A
C53RTB-1115D	60	CARRIER	T2-R1	DC	CG3181	X	*TLD2060A
C53RTB-1116D	60	CARRIER	T2-R1	DC	CG3181	X	TLN4290AV
C53RTB-1125D	60	CARRIER	T2-R2	DC	CG3181	X	TLN4290B
C53RTB-1126D	60	CARRIER	T2-R2	DC	CG3181	X	TRN6006A
C53RTB-1145D	60	CARRIER	T2-R2	DC	CG3181	X	TLN1865A
C53RTB-1146D	60	CARRIER	T2-R2	DC	CG3181	X	TLD8740A
C53RTB-3105D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4758A
C53RTB-3106D	60	CARRIER	T1-R1	DC	CG3181	X	K1005A
C53RTB-3115D	60	CARRIER	T2-R1	DC	CG3181	X	KXN1022A
C53RTB-3116D	60	CARRIER	T2-R1	DC	CG3181	X	TLN8799A
C53RTB-3125D	60	CARRIER	T2-R2	DC	CG3181	X	TLN4295A
C53RTB-3126D	60	CARRIER	T2-R2	DC	CG3181	X	THN6141A
C53RTB-3145D	60	CARRIER	T2-R2	DC	CG3181	X	THN6142A
C53RTB-3146D	60	CARRIER	T2-R2	DC	CG3181	X	TPN1151A
C53RTB-3165D	60	CARRIER	T2-R2	DC	CG3181	X	*TFD6100A
C53RTB-3166D	60	CARRIER	T2-R2	DC	CG3181	X	TKN6936A
C53RTB-3185D	60	CARRIER	T1-R1	DC	CG3181	X	TKN6569A
C53RTB-3186D	60	CARRIER	T1-R1	DC	CG3181	X	TRN6971A
C53RTB-3187D	60	CARRIER	T1-R1	DC	CG3181	X	TRN6976A
C53RTB-3188D	60	CARRIER	T1-R1	DC	CG3181	X	TLN5654A
C53RTB-3189D	60	CARRIER	T1-R1	DC	CG3181	X	TRN6977A
C53RTB-3190D	60	CARRIER	T1-R1	DC	CG3181	X	TRN6188A
C53RTB-3191D	60	CARRIER	T1-R1	DC	CG3181	X	*TLD2190A
C53RTB-3192D	60	CARRIER	T1-R1	DC	CG3181	X	TLN5731A
C53RTB-3193D	60	CARRIER	T1-R1	DC	CG3181	X	TRN6002A
C53RTB-3194D	60	CARRIER	T1-R1	DC	CG3181	X	KLN6210A
C53RTB-3195D	60	CARRIER	T1-R1	DC	CG3181	X	TLN8381A
C53RTB-3196D	60	CARRIER	T1-R1	DC	CG3181	X	TCN1223A
C53RTB-3197D	60	CARRIER	T1-R1	DC	CG3181	X	TLN1245B
C53RTB-3198D	60	CARRIER	T1-R1	DC	CG3181	X	TLN1245A
C53RTB-3199D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4635B
C53RTB-3200D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4638A
C53RTB-3201D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4658A
C53RTB-3202D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4659A
C53RTB-3203D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4660A
C53RTB-3204D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4661A
C53RTB-3205D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4663A
C53RTB-3206D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4665A
C53RTB-3207D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4669B
C53RTB-3208D	60	CARRIER	T1-R1	DC	CG3181	X	TLN4670B

HARMONIC FILTER (132-174 MHz)									
TKN6936A	X	X	X	X	X	X	X	X	X
RF CABLE KIT, TRANSMITTER	X	X	X	X	X	X	X	X	X
RF CABLE KIT, TRANSMITTER	X	X	X	X	X	X	X	X	X
PANEL ASSEMBLY, PA	X	X	X	X	X	X	X	X	X
TRN6971A	X	X	X	X	X	X	X	X	X
HARDWARE KIT, 1-RECEIVER	X	X	X	X	X	X	X	X	X
TRN6976A	X	X	X	X	X	X	X	X	X
HARDWARE KIT, "PL" DECODER	X	X	X	X	X	X	X	X	X
TLN5654A	X	X	X	X	X	X	X	X	X
HARDWARE KIT, 2-RECEIVER	X	X	X	X	X	X	X	X	X
TRN6977A	X	X	X	X	X	X	X	X	X
HARDWARE KIT, "PL" ENCODER	X	X	X	X	X	X	X	X	X
TRN6188A	X	X	X	X	X	X	X	X	X
HARDWARE KIT, PA (132-174 MHz)	X	X	X	X	X	X	X	X	X
*TLD2190A	X	X	X	X	X	X	X	X	X
TTN6003A	X	X	X	X	X	X	X	X	X
"DIGITAL PRIVATE-LINE" ENCODER	X	X	X	X	X	X	X	X	X
TLN5729A	X	X	X	X	X	X	X	X	X
"DIGITAL PRIVATE-LINE" DECODER	X	X	X	X	X	X	X	X	X
TRN6005A	X	X	X	X	X	X	X	X	X
CODE PLUG									
REMOTE CONTROL									
UNITED CONTROL CHASSIS									
TCN1223A	X	X	X	X	X	X	X	X	X
GUARD TONE DECODER MODULE	X	X	X	X	X	X	X	X	X
TLN1245B	X	X	X	X	X	X	X	X	X
C2-R2 TONE CONTROL MODULE	X	X	X	X	X	X	X	X	X
TLN1248A	X	X	X	X	X	X	X	X	X
STATION CONTROL MODULE	X	X	X	X	X	X	X	X	X
TLN4435B	X	X	X	X	X	X	X	X	X
F1-"PL" TONE CONTROL MODULE	X	X	X	X	X	X	X	X	X
TLN4438A	X	X	X	X	X	X	X	X	X
F1 TONE CONTROL MODULE	X	X	X	X	X	X	X	X	X
TLN4458A	X	X	X	X	X	X	X	X	X
F1-"PL" DC TRANSFER MODULE	X	X	X	X	X	X	X	X	X
TLN4459A	X	X	X	X	X	X	X	X	X
F2-R2 MUTE DC TRANSFER MODULE	X	X	X	X	X	X	X	X	X
TLN4460A	X	X	X	X	X	X	X	X	X
F1-CS DC TRANSFER MODULE	X	X	X	X	X	X	X	X	X
TLN4461A	X	X	X	X	X	X	X	X	X
C2-R2 DC TRANSFER MODULE	X	X	X	X	X	X	X	X	X
TLN4463A	X	X	X	X	X	X	X	X	X
F2 TONE CONTROL MODULE	X	X	X	X	X	X	X	X	X
TLN4463A	X	X	X	X	X	X	X	X	X
LINE DRIVER MODULE/2-WIRE 1-RECEIVER	X	X	X	X	X	X	X	X	X
TLN4469B	X	X	X	X	X	X	X	X	X
LINE DRIVER MODULE/2-WIRE 2-RECEIVER	X	X	X	X	X	X	X	X	X
TLN4470B	X	X	X	X	X	X	X	X	X

MODEL	DESCRIPTION
★ TLD1690D/E	POWER AMPLIFIER, 100 WATT
★ TLD2060A	EXCITER-FILTER
TRN6188A	HARDWARE KIT, PL ENCODER
KXN1019B	TRANSMITTER CHANNEL ELEMENT
	RECEIVER
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1885A	SECOND RECEIVER
K1005A	RECEIVER CHANNEL ELEMENT
KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RCVR SHIFTED I-F)
TLD8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
TLN5654A	HARDWARE KIT, PL DECODER
	MISCELLANEOUS
TRN8686A	CARD PULLER

ODE:

● = ONE ITEM SUPPLIED.

2 = TWO ITEMS SUPPLIED.

/ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER.

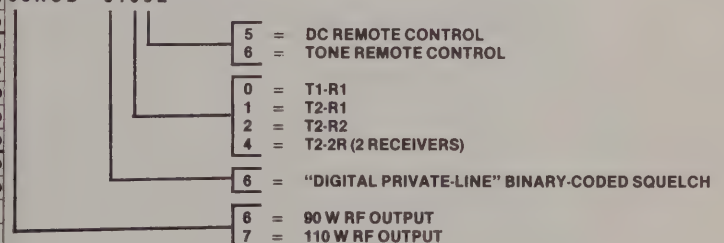
INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

63RCB-3105E



RTB "B" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MIGOR" "COMPA-STATION"
BASE STATIONS - INTERMITTENT DUTY
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

- X = ONE ITEM SUPPLIED.
2 = TWO ITEMS SUPPLIED.
O = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.

* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-6105B

- 5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL
0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)
6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 110 W RF OUTPUT

						DESCRIPTION	
						TRANSMITTER	RECEIVER
STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGN.	MODEL	
C53RTB-6105B	60	"DPL"	T1-R1	DC	CC3181	*TL D2160A	POWER AMPLIFIER, 60-WATT
C53RTB-6106B	60	"DPL"	T1-R1	TONE	CC3181	*TL D2150A	POWER AMPLIFIER, 110-WATT
C53RTB-6115B	60	"DPL"	T2-R1	DC	CC3181	TL D2060A	E-CITER-FILTER (132-174 MHz)
C53RTB-6116B	60	"DPL"	T2-R1	TONE	CC3181	TL D8610AV	POWER CONTROL BOARD (60-WATT)
C53RTB-6125B	60	"DPL"	T2-R2	DC	CC3181	TL D8620AV	POWER CONTROL BOARD (90/110-WATT)
C53RTB-6126B	60	"DPL"	T2-R2	TONE	CC3181	KXN1019B	CHANNEL ELEMENT, TRANSMITTER
C53RTB-6145B	60	"DPL"	T2-2R	DC	CC3181	*TL D8270B	RF & IF BOARD, RECEIVER
C53RTB-6146B	60	"DPL"	T2-2R	TONE	CC3181	TL N4290B	AUDIO POWER AMPLIFIER, RECEIVER
C63RTB-6105B	90	"DPL"	T1-R1	DC	CC3182	TRN6006A	AUDIO & SQUELCH BOARD
C63RTB-6106B	90	"DPL"	T1-R1	TONE	CC3182	TLN1865A	SECOND RECEIVER
C63RTB-6115B	90	"DPL"	T2-R1	DC	CC3182	TL D8740A	SHIFTED IF KIT
C63RTB-6116B	90	"DPL"	T2-R1	TONE	CC3182	TL N4758A	2-RECEIVER COUPLER
C63RTB-6125B	90	"DPL"	T2-R2	DC	CC3182	K1005A	CHANNEL ELEMENT, RECEIVER
C63RTB-6126B	90	"DPL"	T2-R2	TONE	CC3182	KXN1022A	CHANNEL ELEMENT, RECEIVER (FOR 2ND RECEIVER SHIFTED IF)
C63RTB-6145B	90	"DPL"	T2-2R	DC	CC3182	TLN8799A	SERVICE BOARD
C63RTB-6146B	90	"DPL"	T2-2R	TONE	CC3182	TLN4295A	ANTENNA SWITCH
C73RTB-6105B	110	"DPL"	T1-R1	DC	CC3183	THN6141A	CABINET, INDOOR (30")
C73RTB-6106B	110	"DPL"	T1-R1	TONE	CC3183	THN6142A	CABINET, INDOOR (41")
C73RTB-6115B	110	"DPL"	T2-R1	DC	CC3183	TPN1151A	POWER SUPPLY
C73RTB-6116B	110	"DPL"	T2-R1	TONE	CC3183	*TF D6100A	HARMONIC FILTER (132-174 MHz)
C73RTB-6125B	110	"DPL"	T2-R2	DC	CC3183	TKN6936A	RF CABLE KIT, TRANSMITTER
C73RTB-6126B	110	"DPL"	T2-R2	TONE	CC3183	TKN6569A	RF CABLE KIT, TRANSMITTER
C73RTB-6145B	110	"DPL"	T2-2R	DC	CC3183	TRN6971A	PANEL ASSEMBLY, PA
C73RTB-6146B	110	"DPL"	T2-2R	TONE	CC3183	TRN6976A	HARDWARE KIT, 1-RECEIVER
						TLN5654A	HARDWARE KIT, "PL" DECODER
						TRN6977A	HARDWARE KIT, 2-RECEIVER
						TRN6188A	HARDWARE KIT, "PL" ENCODER
						*TL D2190A	HARDWARE KIT, PA (132-174 MHz)
						TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER
						TLN5729A	"DIGITAL PRIVATE-LINE" DECODER
						TRN6005A	CODE PLUG
						TCN1223A	REMOTE CONTROL
						TLN1245B	UNIFIED CONTROL CHASSIS
						TLN1248A	GUARD TONE DECODER MODULE
						TLN4435B	C2-R2 TONE CONTROL MODULE
						TLN4638A	STATION CONTROL MODULE
						TLN4658A	F1-"PL" TONE CONTROL MODULE
						TLN4659A	F1 TONE CONTROL MODULE
						TLN4660A	F1-"PL" DC TRANSFER MODULE
						TLN4661A	F2-R2 MUTE DC TRANSFER MODULE
						TLN4663A	F1-CS DC TRANSFER MODULE
						TLN4665A	C2-R2 DC TRANSFER MODULE
						TLN4669B	F2 TONE CONTROL MODULE
						TLN4670B	LINE DRIVER MODULE/2-WIRE 1-RECEIVER
							LINE DRIVER MODULE/2-WIRE 2-RECEIVER

MODEL	DESCRIPTION
★ TLD1890D/E	POWER AMPLIFIER, 100 WATT
★ TLD2060A	EXCITER-FILTER
TRN6188A	HARDWARE KIT, PL ENCODER
KXN1019B	TRANSMITTER CHANNEL ELEMENT
	RECEIVER
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
TRN6066A	AUDIO & SQUELCH BOARD
TLN1885A	SECOND RECEIVER
K1005A	RECEIVER CHANNEL ELEMENT
KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RCVR SHIFTED I-F)
TLD8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
TLN5654A	HARDWARE KIT, PL DECODER
	MISCELLANEOUS
TRN8886A	CARD PULLER
TLN4295A	ANTENNA SWITCH
TKN6581A	RF CABLE
TKN6882A	RF CABLE
TLN5896A	HARDWARE KIT
TLN5897A	HARDWARE KIT, 2-RECEIVER
THN6142A	CABINET
TPN1110B	POWER SUPPLY
	"PRIVATE LINE"
TLN5731A	PL ENCODER
KLN6210A	SENDER
TRN6002A	PL DECODER
TLN8381A	"VIBRASPOUNDER" RESONANT REED
	REMOTE CONTROL
TCN1223A	UNIFIED CONTROL CHASSIS
TLN1245B	GUARD TONE DECODER MODULE
TLN1248A	C2-R2 TONE CONTROL MODULE
TLN4635B	STATION CONTROL MODULE
TLN4638A	F1-PL TONE CONTROL MODULE
TLN4658A	F1 TONE CONTROL MODULE
TLN4659A	F1-PL DC TRANSFER MODULE
TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
TLN4661A	F1 DC TRANSFER MODULE
TLN4683A	C2-R2 DC TRANSFER MODULE
TLN4685A	F2 TONE CONTROL MODULE
TLN4689B	LINE DRIVER MODULE / 2-WIRE 1-RECEIVER
TLN4670B	LINE DRIVER MODULE / 2-WIRE 2-RECEIVER

C63/73 RTB "E" SUFFIX MODELS

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS — CONTINUOUS DUTY

CARRIER SQUELCH AND "PRIVATE-LINE"

TONE-CODED SQUELCH

132-174 MHz

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs-ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGN.
C63/C73RCB-1105E	□	CARRIER	T1-R1	DC	□□
C63/C73RCB-1106E	□	CARRIER	T1-R1	TONE	□□
C63/C73RCB-1115E	□	CARRIER	T2-R1	DC	□□
C63/C73RCB-1116E	□	CARRIER	T2-R1	TONE	□□
C63/C73RCB-1125E	□	CARRIER	T2-R2	DC	□□
C63/C73RCB-1126E	□	CARRIER	T2-R2	TONE	□□
C63/C73RCB-1145E	□	CARRIER	T2-2R	DC	□□
C63/C73RCB-1146E	□	CARRIER	T2-2R	TONE	□□
C63/C73RCB-3105E	□	PL	T1-R1	DC	□□
C63/C73RCB-3106E	□	PL	T1-R1	TONE	□□
C63/C73RCB-3115E	□	PL	T2-R1	DC	□□
C63/C73RCB-3116E	□	PL	T2-R1	TONE	□□
C63/C73RCB-3125E	□	PL	T2-R2	DC	□□
C63/C73RCB-3126E	□	PL	T2-R2	TONE	□□
C63/C73RCB-3145E	□	PL	T2-2R	DC	□□
C63/C73RCB-3146E	□	PL	T2-2R	TONE	□□

□ C63 SERIES = 90 W
C73 SERIES = 100 W

□□ C63 SERIES = CC3193
C73 SERIES = CC3184

CODE:

● = ONE ITEM SUPPLIED.

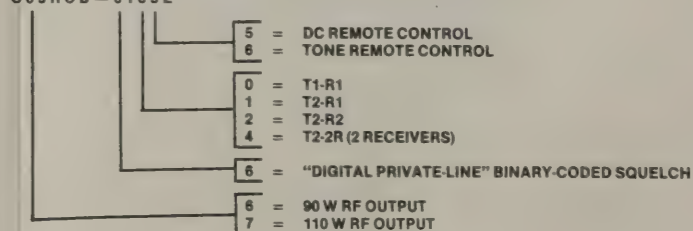
2 = TWO ITEMS SUPPLIED.

— = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER.

★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES
NOTE
STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C63RCB-3105E



EPS-30281-0

"C" SUFFIX MODELS

MODEL CHART

FOR

"COMPA-STATION"

NS — CONTINUOUS DUTY

LINE" BINARY-CODED SQUELCH

132-174 MHz

CODE:

● = ONE ITEM SUPPLIED.

2 = TWO ITEMS SUPPLIED.

✓ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS-ONE		CONTROL TYPE	FCC LICENSE DESIGN.
	FREQ. EACH			
DPL	T1-R1	DC		□□
DPL	T1-R1	TONE		□□
DPL	T2-R1	DC		□□
DPL	T2-R1	TONE		□□
DPL	T2-R2	DC		□□
DPL	T2-R2	TONE		□□
DPL	T2-2R	DC		□□
DPL	T2-2R	TONE		□□

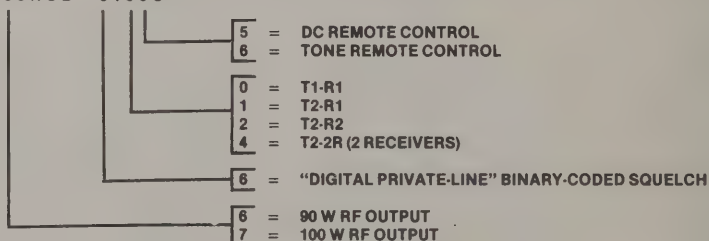
EPS-30282-O

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C 6 3 R C B — 6 1 0 5 C



RTB "D" SUFFIX MODELS

MOTOROLA

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS-INTERMITTENT DUTY

CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH

132-174 MHz

CODE:

☒ = ONE ITEM SUPPLIED

☒ = TWO ITEMS SUPPLIED

☐ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER

FREQS. ARE SEPARATED BY 11.7 MHz #30 KHz (OR A SUB-MULTIPLE

THEREOF), IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST

RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RE-

CEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.

* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON

CARRIER FREQUENCY.

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OR 2ND RECEIVER SHIFTED IF)

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ECEIVER

ECEIVER

MODEL	DESCRIPTION
	TRANSMITTER
★ TLD1690D/E	POWER AMPLIFIER, 100 WATT
★ TLD2060A	EXCITER-FILTER
KXN1019B	TRANSMITTER CHANNEL ELEMENT
	RECEIVER
★ TLD8270B	RF & I-F BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1865A	SECOND RECEIVER
K1005A	RECEIVER CHANNEL ELEMENT
KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RCVR SHIFTED I-F)
TLN8740A	SHIFTED I-F KIT
TLN4758A	2-RECEIVER COUPLER
	MISCELLANEOUS
TRN6686A	CARD PULLER
TLN4295A	ANTENNA SWITCH
TKN6581A	RF CABLE
TKN6882A	RF CABLE
TLN6654A	HARDWARE KIT, PL DECODER
TLN5896A	HARDWARE KIT
TRN6188A	HARDWARE KIT, PL ENCODER
TLN5897A	HARDWARE KIT, 2-RECEIVER
THN6142A	CABINET
TPN1110B	POWER SUPPLY
	"DIGITAL PRIVATE-LINE"
TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER
TRN6005A	CODE PLUG
TLN5729A	"DIGITAL PRIVATE-LINE" DECODER
	REMOTE CONTROL
TCN1223A	UNIFIED CONTROL CHASSIS
TLN1248A	C2-R2 TONE CONTROL MODULE
TLN1245B	GUARD TONE DECODER MODULE
TLN4635B	STATION CONTROL MODULE
TLN4638A	F1-PL TONE CONTROL MODULE
TLN4659A	F1-PL DC TRANSFER MODULE
TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
TLN4663A	C2-R2 DC TRANSFER MODULE
TLN4665A	F2 TONE CONTROL MODULE
TLN4669B	LINE DRIVER MODULE / 2-WIRE 1-RECEIVER
TLN4670B	LINE DRIVER MODULE / 2-WIRE 2-RECEIVER

C63/73 RCB "C" SUFFIX MODELS

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS — CONTINUOUS DUTY

"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

132-174 MHz

STATION MODEL	RF OUTPUT POWER (WATTS)	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS-ONE FREQ. EACH	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGN.
C63/C73RCB-6105C	<input type="checkbox"/>	DPL	T1-R1	DC	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6106C	<input type="checkbox"/>	DPL	T1-R1	TONE	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6115C	<input type="checkbox"/>	DPL	T2-R1	DC	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6116C	<input type="checkbox"/>	DPL	T2-R1	TONE	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6125C	<input type="checkbox"/>	DPL	T2-R2	DC	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6126C	<input type="checkbox"/>	DPL	T2-R2	TONE	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6145C	<input type="checkbox"/>	DPL	T2-2R	DC	<input type="checkbox"/> <input type="checkbox"/>
C63/C73RCB-6146C	<input type="checkbox"/>	DPL	T2-2R	TONE	<input type="checkbox"/> <input type="checkbox"/>

☐ C63 SERIES = 90 W
C73 SERIES = 100 W

☐ C63 SERIES = CC3193
C73 SERIES = CC3184

EPS-30282-O

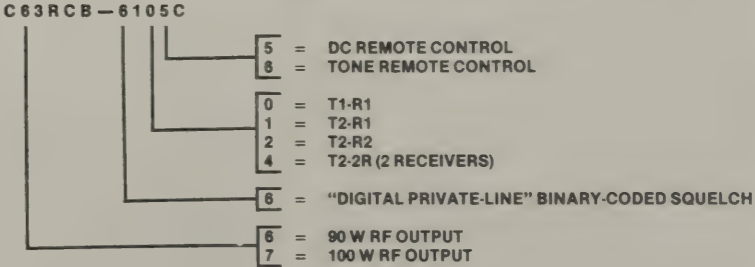
CODE:

- = ONE ITEM SUPPLIED.
- 2 = TWO ITEMS SUPPLIED.

— = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

★ INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES
NOTE
STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.



RCB "B" SUFFIX MODELS
MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
REPEATER (RT) STATIONS
CONTINUOUS & INTERMITTENT DUTY
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

X = ONE ITEM SUPPLIED

O = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz AND
TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR
GREATER.

* = INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER
FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR
150.8-174 MHz)

STATION MODEL VARIABLES
NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE
LETTER & NUMBER COMBINATIONS.

C53RCB-6105BT

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL

6 = "DIGITAL PRIVATE-LINE" SQUELCH

C = CONTINUOUS DUTY
T = INTERMITTENT DUTY

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS
110 W RF OUTPUT WITH INTERMITTENT DUTY

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGNATION	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T	*T	T
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RTB "B" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS - INTERMITTENT DUTY
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

- ☒ = ONE ITEM SUPPLIED.
☒ = TWO ITEMS SUPPLIED.
☐ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.

* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-6105B

- 5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL
0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)
6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 110 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGN.	MODEL		DESCRIPTION	
						MODEL	MODEL	TRANSMITTER	RECEIVER
C53RTB-6105B	60	"DPL"	T1-R1	DC	CC3181	*TLD2160A	*TLD2160A	POWER AMPLIFIER, 60-WATT	
C53RTB-6106B	60	"DPL"	T1-R1	TONE	CC3181	*TLD2150A	*TLD2150A	POWER AMPLIFIER, 110-WATT	
C53RTB-6115B	60	"DPL"	T2-R1	DC	CC3181	*TLD8610A	*TLD8610A	POWER CONTROL BOARD (60-WATT)	
C53RTB-6116B	60	"DPL"	T2-R1	TONE	CC3181	TLD8610AV	TLD8610AV	POWER CONTROL BOARD (60-WATT)	
C53RTB-6125B	60	"DPL"	T2-R2	DC	CC3181	TLD8620A	TLD8620A	POWER CONTROL BOARD (90/110-WATT)	
C53RTB-6126B	60	"DPL"	T2-R2	TONE	CC3181	KXN1019B	KXN1019B	CHANNEL ELEMENT, TRANSMITTER	
C53RTB-6145B	60	"DPL"	T2-2R	DC	CC3181	*TLD8270B	*TLD8270B	RF & IF BOARD, RECEIVER	
C53RTB-6146B	60	"DPL"	T2-2R	TONE	CC3181	TLN4290B	TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER	
C63RTB-6105B	90	"DPL"	T1-R1	DC	CC3182	TRN6006A	TRN6006A	AUDIO & SQUELCH BOARD	
C63RTB-6106B	90	"DPL"	T1-R1	TONE	CC3182	TLN1865A	TLN1865A	SECOND RECEIVER	
C63RTB-6115B	90	"DPL"	T2-R1	DC	CC3182	TLN18740A	TLN18740A	SHIFTED IF KIT	
C63RTB-6116B	90	"DPL"	T2-R1	TONE	CC3182	TLN4758A	TLN4758A	2-RECEIVER COUPLER	
C63RTB-6125B	90	"DPL"	T2-R2	DC	CC3182	K1005A	K1005A	CHANNEL ELEMENT, RECEIVER	
C63RTB-6126B	90	"DPL"	T2-R2	TONE	CC3182	KXN1022A	KXN1022A	CHANNEL ELEMENT, RECEIVER (FOR 2ND RECEIVER SHIFTED IF)	
C63RTB-6145B	90	"DPL"	T2-2R	DC	CC3182	TLN8799A	TLN8799A	MISCELLANEOUS	
C63RTB-6146B	90	"DPL"	T2-2R	TONE	CC3182	TLN4295A	TLN4295A	SERVICE BOARD	
C73RTB-6105B	110	"DPL"	T1-R1	DC	CC3183	THN6141A	THN6141A	ANTENNA SWITCH	
C73RTB-6106B	110	"DPL"	T1-R1	TONE	CC3183	THN6142A	THN6142A	CABINET, INDOOR (30")	
C73RTB-6115B	110	"DPL"	T2-R1	DC	CC3183	TPN1151A	TPN1151A	CABINET, INDOOR (41")	
C73RTB-6116B	110	"DPL"	T2-R1	TONE	CC3183	*TFD6100A	*TFD6100A	POWER SUPPLY	
C73RTB-6125B	110	"DPL"	T2-R2	DC	CC3183	TRN6936A	TRN6936A	HARMONIC FILTER (132-174 MHz)	
C73RTB-6126B	110	"DPL"	T2-R2	TONE	CC3183	TRN6569A	TRN6569A	RF CABLE KIT, TRANSMITTER	
C73RTB-6145B	110	"DPL"	T2-2R	DC	CC3183	TRN6971A	TRN6971A	RF CABLE KIT, TRANSMITTER	
C73RTB-6146B	110	"DPL"	T2-2R	TONE	CC3183	TRN6976A	TRN6976A	PANEL ASSEMBLY, PA	
						TRN5654A	TRN5654A	HARDWARE KIT, 1-RECEIVER	
						TRN6977A	TRN6977A	HARDWARE KIT, "PL" DECODER	
						TRN6188A	TRN6188A	HARDWARE KIT, 2-RECEIVER	
						*TLD2190A	*TLD2190A	HARDWARE KIT, "PL" ENCODER	
						TTN6003A	TTN6003A	HARDWARE KIT, PA (132-174 MHz)	
						TLN5729A	TLN5729A	"DIGITAL PRIVATE-LINE" ENCODER	
						TRN6005A	TRN6005A	"DIGITAL PRIVATE-LINE" DECODER	
						TCN1223A	TCN1223A	CODE PLUG	
						TLN1245B	TLN1245B	REMOTE CONTROL	
						TLN1248A	TLN1248A	UNIFIED CONTROL CHASSIS	
						TLN4635B	TLN4635B	GUARD TONE DECODER MODULE	
						TLN4638A	TLN4638A	G2-R2 TONE CONTROL MODULE	
						TLN4658A	TLN4658A	STATION CONTROL MODULE	
						TLN4659A	TLN4659A	F1 "PL" TONE CONTROL MODULE	
						TLN4660A	TLN4660A	F1 TONE CONTROL MODULE	
						TLN4661A	TLN4661A	F1 "PL" DC TRANSFER MODULE	
						TLN4663A	TLN4663A	F2-R2 MUTE DC TRANSFER MODULE	
						TLN4665A	TLN4665A	F1-CS DC TRANSFER MODULE	
						TLN4669B	TLN4669B	F2-R2 DC TRANSFER MODULE	
						TLN4670B	TLN4670B	F2 TONE CONTROL MODULE	
								LINE DRIVER MODULE/2-WIRE 1-RECEIVER	
								LINE DRIVER MODULE/2-WIRE 2-RECEIVER	

RCB "B" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
REPEATER (RT) STATIONS
CONTINUOUS & INTERMITTENT DUTY
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

☒ = ONE ITEM SUPPLIED

☐ = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz AND TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR GREATER.

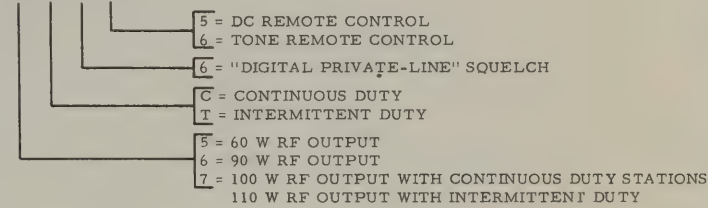
* = INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR 150.8-174 MHz)

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER & NUMBER COMBINATIONS.

C53RCB-6105BT



					DESCRIPTION	
STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	
CONTINUOUS DUTY STATIONS						
C53RCB-6105BT	60	"DPL"	DC	CC3185	*TLDI700C	TRANSMITTER POWER AMPLIFIER, 60-WATT CONTINUOUS DUTY
C53RCB-6106BT	60	"DPL"	TONE	CC3185	*TLDI690C	POWER AMPLIFIER, 100-WATT CONTINUOUS DUTY
C63RCB-6105BT	90	"DPL"	DC	CC3193	*TLDI150A	POWER AMPLIFIER, 110-WATT
C63RCB-6106BT	90	"DPL"	TONE	CC3193	TLDS620AV	POWER CONTROL BOARD (90/110-WATT)
C73RCB-6105BT	100	"DPL"	DC	CC3184	*TLDI200A	EXCITER-FILTER
C73RCB-6106BT	100	"DPL"	TONE	CC3184	KXN1019B	CHANNEL ELEMENT, TRANSMITTER
					TLN5902A	SHIELD, TRANSMITTER
					TRN6974A	SHIELD, TRANSMITTER
					*TLDI270B	RF & IF BOARD, RECEIVER
					TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
					TRN6006A	AUDIO & SQUELCH BOARD
					K1003A	CHANNEL ELEMENT, RECEIVER
					TLN5903A	SHIELD, RECEIVER
					TPN1151A	MISCELLANEOUS POWER SUPPLY
					TPN1110B	POWER SUPPLY
					THN6142A	CABINET, INDOOR (41")
					THN6131A	CABINET, INDOOR (30")
					*TFD6100A	HARMONIC FILTER (132-174 MHz)
					TKN6883A	RF CABLE KIT
					TKN6581A	RF CABLE
					TKN6937A	CABLE KIT
					TKN6569A	RF CABLE KIT, TRANSMITTER
					TLN5806A	HARDWARE KIT
					*TLDI2190A	HARDWARE KIT, PA (132-174 MHz)
					TLN5654A	HARDWARE KIT, "PL" DECODER
					TRN6188A	HARDWARE KIT, "PL" ENCODER
					TRN6975A	HARDWARE KIT, 1-RECEIVER
					TTN6003A	"DIGITAL PRIVATE-LINE"
					TLN5775A	"DIGITAL PRIVATE-LINE" ENCODER
					TLN5779A	"DIGITAL PRIVATE-LINE" DECODER
					TRN6015A	CODE PLUG
					TCN1244A	REMOTE CONTROL
					TLN8709A	UNIFIED CONTROL CHASSIS
					TLN4649B	SERVICE BOARD
					TLN4642A	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
					TLN4635B	SQUELCH GATE MODULE
					TLN4659A	STATION CONTROL MODULE
					TLN4638A	F1-"PL" DC TRANSFER MODULE
					TLN1245B	F1-"PL" TONE CONTROL MODULE
					TLN4636A	GUARD TONE DECODER MODULE
					TLN4636A	TIME-OUT TIMER MODULE
					TLN4636A	DUPLEXER (T1487AF)
					TKN6471A	CAVITY FILTER
					TKN6473A	RF CABLE
					TKN6474A	RF CABLE
					TKN6474A	RF CABLE
					TLN4546A	HARDWARE KIT, MOUNTING (2 OR 4-CAVITIES)

ITEM		DESCRIPTION
TRANSMITTER		
*TLN1700C	X	POWER AMPLIFIER, 60-WATT CONTINUOUS DUTY
*TLN1690C	X	POWER AMPLIFIER, 100-WATT CONTINUOUS DUTY
*TLN2060A	X	EXCITER-FILTER
TLN2902A	X	SHIELD, TRANSMITTER
KNX1019B	X	CHANNEL ELEMENT, TRANSMITTER
*TTD1690BA	X	TRANSMITTER, 90/110-WATT INTERMITTENT DUTY RECEIVER
RECEIVER		
*TLN8270B	X	RF & IF BOARD, RECEIVER
TRN6006A	X	AUDIO & SQUELCH BOARD
TLN4290B	X	AUDIO POWER AMPLIFIER, RECEIVER
K1005A	X	CHANNEL ELEMENT, RECEIVER
TLN1435B	X	SHIELD AND FILTER, RECEIVER
TLN5654A	X	HARDWARE KIT, "PL" DECODER
TLN5903A	X	SHIELD, RECEIVER
MISCELLANEOUS		
TPN1110B	X	POWER SUPPLY
TKN6581A	X	RF CABLE
TKN6883A	X	RF CABLE KIT
TLN5896A	X	HARDWARE KIT
TKN6616A	X	STATION INTERCABLING (INTERMITTENT DUTY STATIONS)
TLN4859A	X	HARDWARE, CABINET (INTERMITTENT DUTY STATIONS)
THN6142A	X	CABINET (CONTINUOUS DUTY STATIONS)
THN6141A	X	CABINET (INTERMITTENT DUTY STATIONS)
"PRIVATE-LINE"		
TLN5731A	X	"PL" ENCODER
TRN6002A	X	"P-" DECODER
TLN6824A	X	"VIBRASENDER" RESONANT REED
TLN8381A	X	"VIBRASPONDER" RESONANT REED
TLN6210A	X	SENDER
REMOTE CONTROL		
TCN1224A	X	UNIFIED CONTROL CHASSIS
TLN8799A	X	SERVICE BOARD
TLN4669B	X	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
TLN4662A	X	SQUELCH GATE MODULE
TLN4635B	X	STATION CONTROL MODULE
TLN4661A	X	F1 DC TRANSFER MODULE
TLN4659A	X	F1 "PL" DC TRANSFER MODULE
TLN4658A	X	F1 TONE CONTROL MODULE
TLN4638A	X	F1 "PL" TONE CONTROL MODULE
TLN1245B	X	GUARD TONE DECODER MODULE
TLN4636A	X	TIME-OUT TIMER MODULE
T1487AF	X	DUPLEXER
TLN8392A	X	CAVITY FILTER
TKN6471A	X	RF CABLE
TKN6473A	X	RF CABLE
TKN6474A	X	RF CABLE
TLN4566A	X	HARDWARE KIT, MOUNTING (2 OR 4-CAVITIES)

RCB "DT" SUFFIX MODELS
MOTOROLA

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

REPEATER (RT) STATIONS

CONTINUOUS & INTERMITTENT DUTY

CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH

132-174 MHz

CODE:

[X] = ONE ITEM SUPPLIED

[O] = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz AND TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR GREATER.

* = INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR 150.8 - 174 MHz)

STATION MODEL VARIABLES

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER & NUMBER COMBINATIONS.

C53RCB-1105DT

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL

1 = CARRIER SQUELCH
3 = "PRIVATE-LINE" TONE-CODED SQUELCH

C = CONTINUOUS DUTY
I = INTERMITTENT DUTY

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS
110 W RF OUTPUT WITH INTERMITTENT DUTY

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	DESCRIPTION
CONTINUOUS DUTY STATIONS						
C53RCB-1105DT	60	CARRIER	DC	CC3185	*TLD1700C	POWER AMPLIFIER, 60-WATT CONTINUOUS DUTY
C53RCB-1106DT	60	CARRIER	TONE	CC3185	*TLD1690C	POWER AMPLIFIER, 100-WATT CONTINUOUS DUTY
C53RCB-3105DT	60	TONE-CODED	DC	CC3185	*TLD2060A	EXCITER-FILTER
C53RCB-3106DT	60	TONE-CODED	TONE	CC3185	TLN5902A	SHIELD, TRANSMITTER
C63RCB-1105DT	90	CARRIER	DC	CC3193	KNX1019B	CHANNEL ELEMENT, TRANSMITTER
C63RCB-1106DT	90	CARRIER	TONE	CC3193	*TTD1690BA	TRANSMITTER, 90/110-WATT INTERMITTENT DUTY
C63RCB-3105DT	90	TONE-CODED	DC	CC3193	*TLD8270B	RF & IF BOARD, RECEIVER
C63RCB-3106DT	90	TONE-CODED	TONE	CC3193	TRN6006A	AUDIO & SQUELCH BOARD
C73RCB-1105DT	100	CARRIER	DC	CC3184	TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
C73RCB-1106DT	100	CARRIER	TONE	CC3184	K1005A	CHANNEL ELEMENT, RECEIVER
C73RCB-3105DT	100	TONE-CODED	DC	CC3184	TLN1435B	SHIELD AND FILTER, RECEIVER
C73RCB-3106DT	100	TONE-CODED	TONE	CC3184	TLN5654A	HARDWARE KIT, "PL" DECODER
C63RTB-1105CT	90	CARRIER	DC	CC3182	TLN5903A	SHIELD, RECEIVER
C63RTB-1106CT	90	CARRIER	TONE	CC3182	TPN1110B	POWER SUPPLY
C63RTB-3105CT	90	TONE-CODED	DC	CC3182	TKN6581A	RF CABLE
C63RTB-3106CT	90	TONE-CODED	TONE	CC3182	TKN6883A	RF CABLE KIT
C73RTB-1105CT	110	CARRIER	DC	CC3183	TLN5896A	HARDWARE KIT
C73RTB-1106CT	110	CARRIER	TONE	CC3183	TKN6616A	STATION INTERCABLING (INTERMITTENT DUTY STATIONS)
C73RTB-3105CT	110	TONE-CODED	DC	CC3183	TLN4859A	HARDWARE, CABINET (INTERMITTENT DUTY STATIONS)
C73RTB-3106CT	110	TONE-CODED	TONE	CC3183	THN6142A	CABINET (CONTINUOUS DUTY STATIONS)
					THN6141A	CABINET (INTERMITTENT DUTY STATIONS)
					TLN5731A	"PL" ENCODER
					TRN6002A	"PL" DECODER
					TLN6824A	"VIBRASENDER" RESONANT REED
					TLN8381A	"VIBRASPENDER" RESONANT REED
					TLN6210A	SENDER
					TCN1224A	REMOTE CONTROL
					TLN8799A	UNIFIED CONTROL CHASSIS
					TLN4669B	SERVICE BOARD
					TLN4662A	LINE DRIVER MODULE 2-WIRE I-RECEIVER
					TLN4635B	SQUELCH GATE MODULE
					TLN4661A	STATION CONTROL MODULE
					TLN4659A	FI DC TRANSFER MODULE
					TLN4658A	FI "PL" DC TRANSFER MODULE
					TLN4638A	FI TONE CONTROL MODULE
					TLN1245B	FI "PL" TONE CONTROL MODULE
					TLN4636A	GUARD TONE DECODER MODULE
					TL487AF	TIME-OUT TIMER MODULE
					TLN8392A	DUPLEXER
					TKN6471A	CAVITY FILTER
					TKN6473A	RF CABLE
					TKN6474A	RF CABLE
					TLN4566A	HARDWARE KIT, MOUNTING (2 OR 4-CAVITIES)

RCB "BT" SUFFIX MODELS
MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
REPEATER (RT) STATIONS
CONTINUOUS & INTERMITTENT DUTY
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

X = ONE ITEM SUPPLIED

0 = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz AND TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR GREATER.

* = INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR 150.8-174 MHz.)

STATION MODEL VARIABLES
NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER & NUMBER COMBINATIONS.

C53RCB-6105BT

- 5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL
6 = "DIGITAL PRIVATE-LINE" SQUELCH
C = CONTINUOUS DUTY
T = INTERMITTENT DUTY
5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS
110 W RF OUTPUT WITH INTERMITTENT DUTY

RCB "BT" SUFFIX MODELS				
MOTOROLA				
MODEL CHART				
FOR				
"MICOR" "COMPA-STATION"				
REPEATER (RT) STATIONS				
CONTINUOUS & INTERMITTENT DUTY				
"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH				
132-174 MHz				
CODE:				
[X] = ONE ITEM SUPPLIED				
[0] = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz & ND TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR GREATER.				
* = INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR 150.8-174 MHz.)				
STATION MODEL VARIABLES				
NOTE				
STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER & NUMBER COMBINATIONS.				
C53RCB-6105BT				
5 = DC REMOTE CONTROL				
6 = TONE REMOTE CONTROL				
6 = "DIGITAL PRIVATE-LINE" SQUELCH				
C = CONTINUOUS DUTY				
T = INTERMITTENT DUTY				
5 = 60 W RF OUTPUT				
6 = 90 W RF OUTPUT				
7 = 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS				
110 W RF OUTPUT WITH INTERMITTENT DUTY				
STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGNATION
CONTINUOUS DUTY STATIONS				
C53RCB-6105BT	60	"DPL"	DC	CC3185
C53RCB-6106BT	60	"DPL"	TONE	CC3185
C63RCB-6105BT	90	"DPL"	DC	CC3193
C63RCB-6106BT	90	"DPL"	TONE	CC3193
C73RCB-6105BT	100	"DPL"	DC	CC3184
C73RCB-6106BT	100	"DPL"	TONE	CC3184

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ITEM	DESCRIPTION
TRANSMITTER	
*TLD1700C	POWER AMPLIFIER, 60-WATT
*TLD1690C	POWER AMPLIFIER, 100-WATT
*TLD2060A	EXCITER-FILTER
TRN6188A	HARDWARE KIT, "PL" ENCODER
TKN10193	TRANSMITTER CHANNEL ELEMENT
RECEIVER	
*TLD8270B	RF & IF BOARD, RECEIVER
TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
TRN6006A	AUDIO & SQUELCH BOARD
TLN1865A	SECOND RECEIVER
K1005A	RECEIVER CHANNEL ELEMENT
KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
TLN8740A	SHIFTED IF KIT
TLN4758A	2-RECEIVER COUPLER
TLN5654A	HARDWARE KIT, "PL" DECODER
MISCELLANEOUS	
TLN8799A	SERVICE BOARD
TLN4295A	ANTENNA SWITCH
TKN6581A	RF CABLE
TKN6582A	RF CABLE
TLN5896A	HARDWARE KIT
TLN5897A	HARDWARE KIT, 2-RECEIVER
THN6142A	CABINET
TPN1110B	POWER SUPPLY
"PRIVATE-LINE"	
TLN5731A	"PL" ENCODER
KLN6210A	SENDER
TRN6002A	"PL" DECODER
TLN8331A	"ULTRASOUNDER" RESONANT REED
REMOTE CONTROL	
TCN1223A	UNIFIED CONTROL CHASSIS
TLN1245B	GUARD TONE DECODER MODULE
TLN1248A	C2-R2 TONE CONTROL MODULE
TLN4635B	STATION CONTROL MODULE
TLN4638A	F1-"PL" TONE CONTROL MODULE
TLN4658A	F1 TONE CONTROL MODULE
TLN4659A	F1-"PL" DC TRANSFER MODULE
TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
TLN4661A	F1 DC TRANSFER MODULE
TLN4663A	C2-R2 DC TRANSFER MODULE
TLN4665A	F2 TONE CONTROL MODULE
TLN4669B	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
TLN4670B	LINE DRIVER MODULE 2-WIRE 2-RECEIVER

[X] = ONE ITE
 [2] = TWO ITE
 [O] = TWO K10
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 * = INDICAT

Δ C6
C7

xxi

RCB "D" SUFFIX MODELS
MOTOROLA

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS - CONTINUOUS DUTY

CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH

132-174 MHz

CODE:

[X] = ONE ITEM SUPPLIED

[2] = TWO ITEMS SUPPLIED

[O] = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQUENCIES ARE SEPARATED BY 11.7 MHz ±30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE, A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RCB-6105B

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL

0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)

6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREOS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREOS. 2R = TWO RCVRs = ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	DESCRIPTION
							TRANSMITTER
						*TLD1700C	POWER AMPLIFIER, 60-WATT
						*TLD1690C	POWER AMPLIFIER, 100-WATT
						*TLD2060A	EXCITER-FILTER
						TRN6188A	HARDWARE KIT, "PL" ENCODER
						KXN10193	TRANSMITTER CHANNEL ELEMENT
							RECEIVER
						*TLN8270B	RF & IF BOARD, RECEIVER
						TLN4290B	AUDIO POWER AMPLIFIER, RECEIVER
						TRN6006A	AUDIO & SQUELCH BOARD
						TLN1865A	SECOND RECEIVER
						K1005A	RECEIVER CHANNEL ELEMENT
						KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
						TLN8740A	SHIFTED IF KIT
						TLN4758A	2-RECEIVER COUPLER
						TLN5654A	HARDWARE KIT, "PL" DECODER
							MISCELLANEOUS
						TLN8799A	SERVICE BOARD
						TLN4295A	ANTENNA SWITCH
						TRN6581A	RF CABLE
						TRN6882A	RF CABLE
						TLN5896A	HARDWARE KIT
						TLN5897A	HARDWARE KIT, 2-RECEIVER
						THN6142A	CABINET
						TPN110B	POWER SUPPLY
							"PRIVATE-LINE"
						TLN5731A	"PL" ENCODER
						KLN6210A	SENDER
						TRN6002A	"PL" DECODER
						TLN8331A	"KBRASPOUNDER" RESONANT REED
							REMOTE CONTROL
						TCN1223A	UNIFIED CONTROL CHASSIS
						TLN1245B	GLARD TONE DECODER MODULE
						TLN1248A	G2-R2 TONE CONTROL MODULE
						TLN4635B	STATION CONTROL MODULE
						TLN4638A	F1 "PL" TONE CONTROL MODULE
						TLN4658A	F1 TONE CONTROL MODULE
						TLN4659A	F1 "PL" DC TRANSFER MODULE
						TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
						TLN4661A	F1 DC TRANSFER MODULE
						TLN4663A	G2-R2 DC TRANSFER MODULE
						TLN4665A	F2 TONE CONTROL MODULE
						TLN4669B	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
						TLN4670B	LINE DRIVER MODULE 2-WIRE 2-RECEIVER

△ C63 SERIES = 90 W
C73 SERIES = 100 W

△△ C63 SERIES = CC3193
C73 SERIES = CC3184

RCB "B" SUFFIX MODELS

MOTOROLA

MODEL CHART

FOR

"MICOR" "COMPA-STATION"

BASE STATIONS - CONTINUOUS DUTY

"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

132-174 MHz

CODE:

[X] = ONE ITEM SUPPLIED

[2] = TWO ITEMS SUPPLIED

[O] = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE, A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RCB-6105B

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)

6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS = ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	DESCRIPTION	
						MODEL	TRANSMITTER
C53RCB-6105B	60	"DPL"	T1-R1	DC	CC3185	*TLD1700C	POWER AMPLIFIER, 60-WATT
C53RCB-6106B	60	"DPL"	T1-R1	TONE	CC3185	*TLD1690C	POWER AMPLIFIER, 100-WATT
C53RCB-6115B	60	"DPL"	T2-R1	DC	CC3185	*TLD2060A	EXCITER-FILTER
C53RCB-6116B	60	"DPL"	T2-R1	TONE	CC3185	KXN1019B	TRANSMITTER CHANNEL ELEMENT
C53RCB-6125B	60	"DPL"	T2-R2	DC	CC3185	*TLD8270B	RECEIVER
C53RCB-6126B	60	"DPL"	T2-R2	TONE	CC3185	TLN4290B	RF & IF BOARD, RECEIVER
C53RCB-6145B	60	"DPL"	T2-2R	DC	CC3185	TRN6006A	AUDIO POWER AMPLIFIER, RECEIVER
C53RCB-6146B	60	"DPL"	T2-2R	TONE	CC3185	TLN1865A	AUDIO & SQUELCH BOARD
C63/C73RCB-6105B	△	"DPL"	T1-R1	DC	△△	K1005A	SECOND RECEIVER
C63/C73RCB-6106B	△	"DPL"	T1-R1	TONE	△△	KXN1022A	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6115B	△	"DPL"	T2-R1	DC	△△	TLN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C63/C73RCB-6116B	△	"DPL"	T2-R1	TONE	△△	TLN8740A	SHIFTED IF KIT
C63/C73RCB-6125B	△	"DPL"	T2-R2	DC	△△	TLN4758A	2-RECEIVER COUPLER
C63/C73RCB-6126B	△	"DPL"	T2-R2	TONE	△△	TLN8799A	MISCELLANEOUS
C63/C73RCB-6145B	△	"DPL"	T2-2R	DC	△△	TLN4295A	SERVICE BOARD
C63/C73RCB-6146B	△	"DPL"	T2-2R	TONE	△△	TKN6581A	ANTENNA SWITCH
						TKN6882A	RF CABLE
						TLN5654A	RF CABLE
						TLN5896A	HARDWARE KIT, "PL" DECODER
						TRN6188A	HARDWARE KIT, "PL" ENCODER
						TLN5897A	HARDWARE KIT, 2-RECEIVER
						THN6142A	CABINET
						TPN1110B	POWER SUPPLY
						TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER
						TRN6005A	"DIGITAL PRIVATE-LINE" DECODER
						TLN5729A	"DIGITAL PRIVATE-LINE" ENCODER
						TLN5725A	REMOTE CONTROL
						TCN1223A	UNIFIED CONTROL CHASSIS
						TLN1248A	C2-R2 TONE CONTROL MODULE
						TLN1245B	GUARD TONE DECODER MODULE
						TLN4635B	STATION CONTROL MODULE
						TLN4638A	F1-"PL" TONE CONTROL MODULE
						TLN4659A	F1-"PL" DC TRANSFER MODULE
						TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
						TLN4663A	C2-R2 DC TRANSFER MODULE
						TLN4665A	F2 TONE CONTROL MODULE
						TLN4669B	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
						TLN4670B	LINE DRIVER MODULE 2-WIRE 2-RECEIVER

△ C63 SERIES = 90 W
C73 SERIES = 100 W△△ C63 SERIES = CC3193
C73 SERIES = CC3184

EPS-22906-C

RTB "C" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-INTERMITTENT DUTY
CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH
132-174 MHz
"C" SUFFIX MODELS

CODE:

- ☒ = ONE ITEM SUPPLIED
- ☐ 2 = TWO ITEMS SUPPLIED
- ☐ 0 = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.

* INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-1105C

- 5 = DC REMOTE CONTROL
- 6 = TONE REMOTE CONTROL
- 0 = T1-R1
- 1 = T2-R1
- 2 = T2-R2
- 4 = T2-2R (2 RECEIVERS)
- 1 = CARRIER SQUELCH
- 3 = "PRIVATE-LINE" TONE-CODED SQUELCH
- 5 = 60 W RF OUTPUT
- 6 = 90 W RF OUTPUT
- 7 = 110 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	MODEL	DESCRIPTION
C53RTB-1105G	60	CARRIER	T1-R1	DC	CC3181	*T1D1700B	TRANSMITTER 60 W
C53RTB-1106C	60	CARRIER	T1-R1	TONE	CC3181	*T1D1690BA	TRANSMITTER 90-110 W
C53RTB-1115C	60	CARRIER	T2-R1	DC	CC3181	KXN1019B	TRANSMITTER CHANNEL ELEMENT
C53RTB-1116C	60	CARRIER	T2-R1	TONE	CC3181		RECEIVER
C53RTB-1125C	60	CARRIER	T2-R2	DC	CC3181	*TRD1800BB	RECEIVER CHANNEL ELEMENT
C53RTB-1126C	60	CARRIER	T2-R2	TONE	CC3181	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RTB-1145C	60	CARRIER	T2-2R	DC	CC3181	TLN4740A	SHIFTED IF KIT
C53RTB-1146C	60	CARRIER	T2-2R	TONE	CC3181	TLN4758A	2-RECEIVER COUPLER
C53RTB-3105O	60	"PL"	T1-R1	DC	CC3181		MISCELLANEOUS
C53RTB-3106C	60	"PL"	T1-R1	TONE	CC3181	TLN8799A	SERVICE BOARD
C53RTB-3115C	60	"PL"	T2-R1	DC	CC3181	TLN4295A	ANTENNA SWITCH
C53RTB-3116C	60	"PL"	T2-R1	TONE	CC3181	TLN4735A	HARDWARE, CABINET
C53RTB-3125C	60	"PL"	T2-R2	DC	CC3181	TLN6141A	CABINET
C53RTB-3126C	60	"PL"	T2-R2	TONE	CC3181	TPN1110B	POWER SUPPLY (FORMERLY TPN110A)
C53RTB-3145C	60	"PL"	T2-2R	DC	CC3181	TKN6561A	STATION INTERCABLING (1-RECEIVER STATIONS)
C53RTB-3146C	60	"PL"	T2-2R	TONE	CC3181	TKN6562A	STATION INTERCABLING (2-RECEIVER STATIONS)
C63RTB-1105C	90	CARRIER	T1-R1	DC	CC3182	TLN5731A	"PL" ENCODER
C63RTB-1106C	90	CARRIER	T1-R1	TONE	CC3182	TLN6824A	"VIBRASENDER" RESONANT REED
C63RTB-1115C	90	CARRIER	T2-R1	DC	CC3182	TRN6002A	"PL" DECODER
C63RTB-1116C	90	CARRIER	T2-R1	TONE	CC3182	TLN8381A	"VIBRASPINDER" RESONANT REED
C63RTB-1125C	90	CARRIER	T2-R2	DC	CC3182		REMOTE CONTROL
C63RTB-1126C	90	CARRIER	T2-R2	TONE	CC3182	ICN1107A	REMOTE CONTROL CHASSIS
C63RTB-1145C	90	CARRIER	T2-2R	DC	CC3182	TLN1245B	GUARD TONE DECODER MODULE
C63RTB-1146C	90	CARRIER	T2-2R	TONE	CC3182	TLN1248A	C2-R2 TONE CONTROL MODULE
C63RTB-3105C	90	"PL"	T1-R1	DC	CC3182	TLN4635B	STATION CONTROL MODULE
C63RTB-3115C	90	"PL"	T2-R1	DC	CC3182	TLN4638A	F1-"PL" TONE CONTROL MODULE
C63RTB-3116C	90	"PL"	T2-R1	TONE	CC3182	TLN4658A	F1 TONE CONTROL MODULE
C63RTB-3125C	90	"PL"	T2-R2	DC	CC3182	TLN4659A	F1-"PL" DC TRANSFER MODULE
C63RTB-3126C	90	"PL"	T2-R2	TONE	CC3182	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
C63RTB-3145C	90	"PL"	T2-2R	DC	CC3182	TLN4661A	F1-CS DC TRANSFER MODULE
C63RTB-3146C	90	"PL"	T2-2R	TONE	CC3182	TLN4663A	C2-R2 DC TRANSFER MODULE
C73RTB-1105C	110	CARRIER	T1-R1	DC	CC3183	TLN4665A	F2 TONE CONTROL MODULE
C73RTB-1106C	110	CARRIER	T1-R1	TONE	CC3183	TLN4669A	LINE DRIVER MODULE/2-WIRE 1-RECEIVER
C73RTB-1115C	110	CARRIER	T2-R1	DC	CC3183	TLN4700A	LINE DRIVER MODULE/2-WIRE 2-RECEIVER
C73RTB-1116C	110	CARRIER	T2-R1	TONE	CC3183		
C73RTB-1125C	110	CARRIER	T2-R2	DC	CC3183		
C73RTB-1126C	110	CARRIER	T2-R2	TONE	CC3183		
C73RTB-1145C	110	CARRIER	T2-2R	DC	CC3183		
C73RTB-1146C	110	CARRIER	T2-2R	TONE	CC3183		
C73RTB-3105C	110	"PL"	T1-R1	DC	CC3183		
C73RTB-3106C	110	"PL"	T1-R1	TONE	CC3183		
C73RTB-3115C	110	"PL"	T2-R1	DC	CC3183		
C73RTB-3116C	110	"PL"	T2-R1	TONE	CC3183		
C73RTB-3125C	110	"PL"	T2-R2	DC	CC3183		
C73RTB-3126C	110	"PL"	T2-R2	TONE	CC3183		
C73RTB-3145C	110	"PL"	T2-2R	DC	CC3183		
C73RTB-3146C	110	"PL"	T2-2R	TONE	CC3183		

TLN8381A	"VIBRASPOUNDER" RESONANT REED	REMOTE CONTROL
TCN1107A	REMOTE CONTROL CHASSIS	
TLN8799A	SERVICE BOARD	
TLN4669A	LINE DRIVER MODULE 2-WIRE 1-RECEIVER	
TLN4662A	SQUELCH GATE MODULE	
TLN4635A	STATION CONTROL MODULE	
TLN4661A	F1 DC TRANSFER MODULE	
TLN4659A	F1 "PL" DC TRANSFER MODULE	
TLN4658A	F1 TONE CONTROL MODULE	
TLN4638A	F1 "PL" TONE CONTROL MODULE	
TLN1245B	GUARD TONE DECODER MODULE	
TLN4636A	TIME-OUT TIMER MODULE	

RCB "C" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-CONTINUOUS DUTY
CARRIER SQUELCH AND "PRIVATE-LINE" TONE-CODED SQUELCH
132-174 MHz
"C" SUFFIX MODELS

CODE:

☒ = ONE ITEM SUPPLIED

2 = TWO ITEMS SUPPLIED

0 = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ± 30 KHz (OR A SUBMULTIPLE THEREOF). IN THIS CASE, A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER

* INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RCB-1105C

- 5 = DC REMOTE CONTROL
- 6 = TONE REMOTE CONTROL
- 0 = T1-R1
- 1 = T2-R1
- 2 = T2-R2
- 4 = T2-2R (2 RECEIVER)
- 1 = CARRIER SQUELCH
- 3 = "PRIVATE-LINE" TONE-CODED SQUELCH
- 5 = 60 W RF OUTPUT
- 6 = 90 W RF OUTPUT
- 7 = 100 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	DESCRIPTION
C53RCB-1105C	60	C.S.	T1-R1	DC	CC3185	*TLD1700B	POWER AMPLIFIER, 60-WATT
C53RCB-1106C	60	C.S.	T1-R1	TONE	CC3185	*TLD1690B	POWER AMPLIFIER, 100-WATT
C53RCB-1115C	60	C.S.	T2-R1	DC	CC3185	*TLD1710B	EXCITER-DRIVER
C53RCB-1116C	60	C.S.	T2-R1	TONE	CC3185	KXN1019B	TRANSMITTER CHANNEL ELEMENT
C53RCB-1125C	60	C.S.	T2-R2	DC	CC3185	*TRD1800BB	RECEIVER
C53RCB-1126C	60	C.S.	T2-R2	TONE	CC3185	K1005A	RECEIVER CHANNEL ELEMENT
C53RCB-1145C	60	C.S.	T2-2R	DC	CC3185	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RCB-1146C	60	C.S.	T2-2R	TONE	CC3185	TLD8740A	SHIFTED IF KIT
C53RCB-3105C	60	"PL"	T1-R1	DC	CC3185	TLD4758A	2-RECEIVER COUPLER
C53RCB-3106C	60	"PL"	T1-R1	TONE	CC3185	TLN8799A	SERVICE BOARD
C53RCB-3115C	60	"PL"	T2-R1	DC	CC3185	TLN4295A	ANTENNA SWITCH
C53RCB-3116C	60	"PL"	T2-R1	TONE	CC3185	TLN4863A	HARDWARE, CABINET
C53RCB-3125C	60	"PL"	T2-R2	DC	CC3185	THN6142A	CABINET
C53RCB-3126C	60	"PL"	T2-R2	TONE	CC3185	TPN1110B	POWER SUPPLY (FORMERLY TPN111-A)
C53RCB-3145C	60	"PL"	T2-2R	DC	CC3185	TKN6563A	STATION INTERCABLE (1-RECEIVER STATIONS)
C53RCB-3146C	60	"PL"	T2-2R	TONE	CC3185	TKN6571A	STATION INTERCABLE (2-RECEIVER STATIONS)
C63/C73RCB-1105C	Δ	C.S.	T1-R1	DC	ΔΔ	TLN5731A	"PL" ENCODER
C63/C73RCB-1106C	Δ	C.S.	T1-R1	TONE	ΔΔ	TLN6824A	"VIBRASENDER" RESONANT REED
C63/C73RCB-1115C	Δ	C.S.	T2-R1	DC	ΔΔ	TRN6002A	"PL" DECODER
C63/C73RCB-1116C	Δ	C.S.	T2-R1	TONE	ΔΔ	TLN8381A	"VIBRASPODER" RESONANT REED
C63/C73RCB-1125C	Δ	C.S.	T2-R2	DC	ΔΔ	TCN1107A	REMOTE CONTROL
C63/C73RCB-1126C	Δ	C.S.	T2-R2	TONE	ΔΔ	TLN1245B	GUARD TONE DECODER MODULE
C63/C73RCB-1145C	Δ	C.S.	T2-2R	DC	ΔΔ	TLN1248A	C2-R2 TONE CONTROL MODULE
C63/C73RCB-1146C	Δ	C.S.	T2-2R	TONE	ΔΔ	TLN4635B	STATION CONTROL MODULE
C63/C73RCB-3105C	Δ	"PL"	T1-R1	DC	ΔΔ	TLN4638A	F1 "PL" TONE CONTROL MODULE
C63/C73RCB-3106C	Δ	"PL"	T1-R1	TONE	ΔΔ	TLN4658A	F1 TONE CONTROL MODULE
C63/C73RCB-3115C	Δ	"PL"	T2-R1	DC	ΔΔ	TLN4659A	F1 "PL" DC TRANSFER MODULE
C63/C73RCB-3116C	Δ	"PL"	T2-R1	TONE	ΔΔ	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
C63/C73RCB-3125C	Δ	"PL"	T2-R2	DC	ΔΔ	TLN4661A	F1 DC TRANSFER MODULE
C63/C73RCB-3126C	Δ	"PL"	T2-R2	TONE	ΔΔ	TLN4663A	C2-R2 DC TRANSFER MODULE
C63/C73RCB-3145C	Δ	"PL"	T2-2R	DC	ΔΔ	TLN4665A	F2 TONE CONTROL MODULE
C63/C73RCB-3146C	Δ	"PL"	T2-2R	TONE	ΔΔ	TLN4669B	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
						TLN4670B	LINE DRIVER MODULE 2-WIRE 2-RECEIVER

Δ C63 SERIES = 90 W
C73 SERIES = 100 W

Δ Δ C63 SERIES = CC3193
C73 SERIES = CC3184

EPS-16866-D

RCB "BT" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
REPEATER (RT) STATIONS
CONTINUOUS & INTERMITTENT DUTY
"BT" SUFFIX MODELS
132-174 MHz

CODE:

☒ = ONE ITEM SUPPLIED

☐ = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE
148 MHz AND TRANSMIT-RECEIVE FREQUENCIES ARE
SEPARATED BY 1.5 MHz OR GREATER.

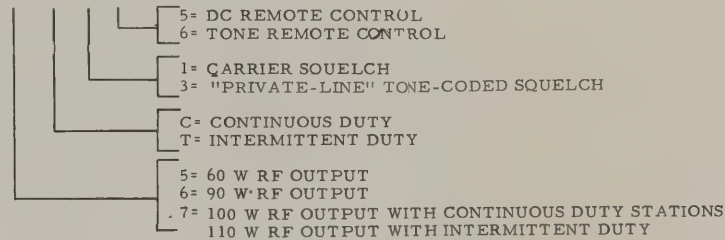
* INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS
ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS
AVAILABLE ONLY FOR 150.8-174 MHz)

STATION MODEL VARIABLE:

NOTE

STATION MODELS ARE NOT AVAILABLE FOR
ALL POSSIBLE LETTER & NUMBER COMBINATIONS.

C53RCB-1105BT



STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	DESCRIPTION
CONTINUOUS DUTY STATIONS						
C53RCB-1105BT	60	CARRIER	DC	CC3185		TRANSMITTER
C53RCB-1106BT	60	CARRIER	TONE	CC3185		POWER AMPLIFIER, 60-WATT CONTINUOUS DUTY
C53RCB-3105BT	60	TONE-CODED	DC	CC3185		POWER AMPLIFIER, 100-WATT CONTINUOUS DUTY
C53RCB-3106BT	60	TONE-CODED	TONE	CC3185		EXCITER-DRIVER (CONTINUOUS DUTY STATIONS)
C63RCB-1105BT	90	CARRIER	DC	CC3193		SHIELD AND FILTER, TRANSMITTER
C63RCB-1106BT	90	CARRIER	TONE	CC3193		SHIELD AND FILTER, TRANSMITTER
C63RCB-3105BT	90	TONE-CODED	DC	CC3193		CHANNEL ELEMENT, TRANSMITTER
C63RCB-3106BT	90	TONE-CODED	TONE	CC3193		CHANNEL ELEMENT, TRANSMITTER
C73RCB-1105BT	100	CARRIER	DC	CC3184		TRANSMITTER, 90/110-WATT INTERMITTENT DUTY
C73RCB-1106BT	100	CARRIER	TONE	CC3184		RECEIVER
C73RCB-3105BT	100	TONE-CODED	DC	CC3184		RECEIVER
C73RCB-3106BT	100	TONE-CODED	TONE	CC3184		CHANNEL ELEMENT, RECEIVER
INTERMITTENT DUTY STATIONS						
C63RTB-1105BT	90	CARRIER	DC	CC3182		SHIELD AND FILTER, RECEIVER
C63RTB-1106BT	90	CARRIER	TONE	CC3182		SHIELD AND FILTER, RECEIVER
C63RTB-3105BT	90	TONE-CODED	DC	CC3182		MISCELLANEOUS
C63RTB-3106BT	90	TONE-CODED	TONE	CC3182		DUPLEXER
C73RTB-1105BT	110	CARRIER	DC	CC3183		POWER SUPPLY (FORMERLY TPN110A)
C73RTB-1106BT	110	CARRIER	TONE	CC3183		STATION INTERCABLING (CONTINUOUS DUTY STATIONS)
C73RTB-3105BT	110	TONE-CODED	DC	CC3183		STATION INTERCABLING (INTERMITTENT DUTY STATIONS)
C73RTB-3106BT	110	TONE-CODED	TONE	CC3183		HARDWARE, CABINET (CONTINUOUS DUTY STATIONS)
						HARDWARE, CABINET (INTERMITTENT DUTY STATIONS)
						CABINET (CONTINUOUS DUTY STATIONS)
						CABINET (INTERMITTENT DUTY STATIONS)
						"PRIVATE-LINE"
						"PL" ENCODER
						"PL" DECODER
						"VIBRASENDER" RESONANT REED
						"VIBRASPINDER" RESONANT REED
						REMOTE CONTROL
						REMOTE CONTROL CHASSIS
						SERVICE BOARD
						LINE DRIVER MODULE 2-WIRE 1-RECEIVER
						SQUELCH GATE MODULE
						STATION CONTROL MODULE
						F1 DC TRANSFER MODULE
						F1 "PL" DC TRANSFER MODULE
						F1 TONE CONTROL MODULE
						F1 "PL" TONE CONTROL MODULE
						GUARD TONE DECODER MODULE
						TIME-OUT TIMER MODULE

CH

CC5181

EPS-13239-D

“B” SUFFIX
MODELS

MOTOROLA

MODEL CHART
FOR
"MICCR" "COMPA-STATION"
BASE STATIONS-INTERMITTENT DUTY
"B" SUFFIX MODELS
132-174 MHz

CODE:

- ☒ = ONE ITEM SUPPLIED
☒ = TWO ITEMS SUPPLIED
○ = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.
* INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-1105B

- 5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL
0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)
1 = CARRIER SQUELCH
3 = "PRIVATE-LINE" TONE-CODED SQUELCH
5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 110 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRS - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	MODEL	DESCRIPTION
C53RTB-1105B	60	CARRIER	T1-R1	DC	CC3181	*TTD1700A	TRANSMITTER 60 W
C53RTB-1106B	60	CARRIER	T1-R1	TONE	CC3181	*TTD1690AA	TRANSMITTER 90-110 W
C53RTB-1115B	60	CARRIER	T2-R1	DC	CC3181	KXN1019A	TRANSMITTER CHANNEL ELEMENT RECEIVER
C53RTB-1116B	60	CARRIER	T2-R1	TONE	CC3181	*TRD1800AB	RECEIVER
C53RTB-1125B	60	CARRIER	T2-R2	DC	CC3181	K1005A	RECEIVER CHANNEL ELEMENT
C53RTB-1126B	60	CARRIER	T2-R2	TONE	CC3181	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RTB-1145B	60	CARRIER	T2-2R	DC	CC3181	TLN8740A	SHIFTED IF KIT
C53RTB-1146B	60	CARRIER	T2-2R	TONE	CC3181	TLN4758A	2-RECEIVER COUPLER
C53RTB-3105B	60	"PL"	T1-R1	DC	CC3181	TLN8799A	MISCELLANEOUS
C53RTB-3106B	60	"PL"	T1-R1	TONE	CC3181	TLN4295A	SERVICE BOARD
C53RTB-3115B	60	"PL"	T2-R1	DC	CC3181	TLN4295A	ANTENNA SWITCH
C53RTB-3116B	60	"PL"	T2-R1	TONE	CC3181	TLN4735A	HARDWARE, CABINET
C53RTB-3125B	60	"PL"	T2-R2	DC	CC3181	TLN6141A	CABINET
C53RTB-3126B	60	"PL"	T2-R2	TONE	CC3181	TPN1110B	POWER SUPPLY (FORMERLY TPN110A)
C53RTB-3145B	60	"PL"	T2-2R	DC	CC3181	TKN6561A	STATION INTERCABLING (1-RECEIVER STATIONS)
C53RTB-3146B	60	"PL"	T2-2R	TONE	CC3181	TKN6562A	STATION INTERCABLING (2-RECEIVER STATIONS)
C63RTB-1105B	90	CARRIER	T1-R1	DC	CC3182	TLN4293B	"PL" ENCODER
C63RTB-1106B	90	CARRIER	T1-R1	TONE	CC3182	TLN6824A	"VIBRASENDER" RESONANT REED
C63RTB-1115B	90	CARRIER	T2-R1	DC	CC3182	TLN4294B	"PL" DECODER
C63RTB-1116B	90	CARRIER	T2-R1	TONE	CC3182	TLN8381A	"VIBRASPOUNDER" RESONANT REED
C63RTB-1125B	90	CARRIER	T2-R2	DC	CC3182	TCN1107A	REMOTE CONTROL
C63RTB-1126B	90	CARRIER	T2-R2	TONE	CC3182	TLN1245B	REMOTE CONTROL CHASSIS
C63RTB-1145B	90	CARRIER	T2-2R	DC	CC3182	TLN1245B	GUARD TONE DECODER MODULE
C63RTB-1146B	90	CARRIER	T2-2R	TONE	CC3182	TLN1248A	C2-R2 TONE CONTROL MODULE
C63RTB-3105B	90	"PL"	T1-R1	DC	CC3182	TLN4635A	STATION CONTROL MODULE
C63RTB-3106B	90	"PL"	T1-R1	TONE	CC3182	TLN4638A	F1 "PL" TONE CONTROL MODULE
C63RTB-3115B	90	"PL"	T2-R1	DC	CC3182	TLN4658A	F1 TONE CONTROL MODULE
C63RTB-3116B	90	"PL"	T2-R1	TONE	CC3182	TLN4659A	F1 "PL" DC TRANSFER MODULE
C63RTB-3125B	90	"PL"	T2-R2	DC	CC3182	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
C63RTB-3126B	90	"PL"	T2-R2	TONE	CC3182	TLN4661A	F1-CS DC TRANSFER MODULE
C63RTB-3145B	90	"PL"	T2-2R	DC	CC3182	TLN4663A	C2-R2 DC TRANSFER MODULE
C63RTB-3146B	90	"PL"	T2-2R	TONE	CC3182	TLN4665A	F2 TONE CONTROL MODULE
C73RTB-1105B	110	CARRIER	T1-R1	DC	CC3183	TLN4669A	LINE DRIVER MODULE/2-WIRE 1-RECEIVER
C73RTB-1106B	110	CARRIER	T1-R1	TONE	CC3183	TLN4670A	LINE DRIVER MODULE/2-WIRE 2-RECEIVER
C73RTB-1115B	110	CARRIER	T2-R1	DC	CC3183		
C73RTB-1116B	110	CARRIER	T2-R1	TONE	CC3183		
C73RTB-1125B	110	CARRIER	T2-R2	DC	CC3183		
C73RTB-1126B	110	CARRIER	T2-R2	TONE	CC3183		
C73RTB-1145B	110	CARRIER	T2-2R	DC	CC3183		
C73RTB-1146B	110	CARRIER	T2-2R	TONE	CC3183		
C73RTB-3105B	110	"PL"	T1-R1	DC	CC3183		
C73RTB-3106B	110	"PL"	T1-R1	TONE	CC3183		
C73RTB-3115B	110	"PL"	T2-R1	DC	CC3183		
C73RTB-3116B	110	"PL"	T2-R1	TONE	CC3183		
C73RTB-3125B	110	"PL"	T2-R2	DC	CC3183		
C73RTB-3126B	110	"PL"	T2-R2	TONE	CC3183		
C73RTB-3145B	110	"PL"	T2-2R	DC	CC3183		
C73RTB-3146B	110	"PL"	T2-2R	TONE	CC3183		

MOTOROLA

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS
110 W RF OUTPUT WITH INTERMITTENT DUTY

EPS-18077-D

LICENSE SIGNATION		ITEM	DESCRIPTION
			TRANSMITTER
		*TLD1700A	POWER AMPLIFIER, 60-WATT CONTINUOUS DUTY
		*TLD1690A	POWER AMPLIFIER, 100-WATT CONTINUOUS DUTY
		*TLD1710A	EXCITER-DRIVER (CONTINUOUS DUTY STATIONS)
		TLN1434A	SHIELD AND FILTER, TRANSMITTER
		KNX1019A	CHANNEL ELEMENT, TRANSMITTER
		*TTD1690AA	TRANSMITTER, 90/110-WATT INTERMITTENT DUTY
			RECEIVER
		*TRD1800AB	RECEIVER
		K1005A	CHANNEL ELEMENT, RECEIVER
		TLN1435A	SHIELD AND FILTER, RECEIVER
			MISCELLANEOUS
		TL487AF	DUPLEXER
		TPN1095A	POWER SUPPLY, 60-WATT CONTINUOUS DUTY AND 90/110-WATT INTERMITTENT DUTY
		TPN1096A	POWER SUPPLY, 90/100-WATT CONTINUOUS DUTY
		TKN6617A	STATION INTERCABLING (CONTINUOUS DUTY STATIONS)
		TKN6616A	STATION INTERCABLING (INTERMITTENT DUTY STATIONS)
		TLN4861A	HARDWARE, CABINET (CONTINUOUS DUTY STATIONS)
		TLN4859A	HARDWARE, CABINET (INTERMITTENT DUTY STATIONS)
		THN6142A	CABINET (CONTINUOUS DUTY STATIONS)
		THN6141A	CABINET (INTERMITTENT DUTY STATIONS)
			"PRIVATE-LINE"
		TLN4293B	"PL" ENCODER
		TLN4294B	"PL" DECODER
		TLN6824A	"VIBRASENDER" RESONANT REED
		TLN8381A	"VIBRASPOUNDER" RESONANT REED
			REMOTE CONTROL
		TCN1107A	REMOTE CONTROL CHASSIS
		TLN8799A	SERVICE BOARD
		TLN4669A	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
		TLN4662A	SQUELCH GATE MODULE
		TLN4635A	STATION CONTROL MODULE
		TLN4661A	F1 DC TRANSFER MODULE
		TLN4659A	F1-"PL" DC TRANSFER MODULE
		TLN4658A	F1 TONE CONTROL MODULE
		TLN4638A	F1-"PL" TONE CONTROL MODULE
		TLN1245B	GUARD TONE DECODER MODULE
		TLN4636A	TIME-OUT TIMER MODULE

RCB "AT" SUFFIX MODELS

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
REPEATER (RT) STATIONS
CONTINUOUS & INTERMITTENT DUTY
"AT" SUFFIX MODELS
132-174 MHz

CODE:

[X] = ONE ITEM SUPPLIED

0 = DUPLEXER UNIT SUPPLIED ONLY WHEN USED ABOVE 148 MHz AND TRANSMIT-RECEIVE FREQUENCIES ARE SEPARATED BY 1.5 MHz OR GREATER.

* INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY. (NOTE: 60-WATT STATIONS AVAILABLE ONLY FOR 150.8-174 MHz)

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR
ALL POSSIBLE LETTER & NUMBER COMBINATIONS.

C53RCB-1105 AT

5= DC REMOTE CONTROL
6= TONE REMOTE CONTROL
1= CARRIER SQUELCH
3= "PRIVATE-LINE" SQUELCH

C= CONTINUOUS DUTY
T= INTERMITTENT DUTY

5= 60 W RF OUTPUT
6= 90 W RF OUTPUT
7= 100 W RF OUTPUT WITH CONTINUOUS DUTY STATIONS
110 W RF OUTPUT WITH INTERMITTENT DUTY

[illegible]

"A" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-CONTINUOUS DUTY
"A" SUFFIX MODELS
132-174 MHz

CODE:

☒ = ONE ITEM SUPPLIED

☐ 2 = TWO ITEMS SUPPLIED

☐ 0 = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 KHz (OR A SUBMULTIPLE THEREOF). IN THIS CASE, A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

* INDICATES A MODEL SERIES. SPECIFIC MODEL DEPENDS ON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RCB-1105A

- 5 = DC REMOTE CONTROL
- 6 = TONE REMOTE CONTROL
- 0 = T1-R1
- 1 = T2-R1
- 2 = T2-R2
- 4 = T2-2R (2 RECEIVER)
- 1 = CARRIER SQUELCH
- 3 = "PRIVATE-LINE" TONE-CODED SQUELCH
- 5 = 60 W RF OUTPUT
- 6 = 90 W RF OUTPUT
- 7 = 100 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	ITEM	DESCRIPTION
C53RCB-1105A	60	C.S.	T1-R1	DC	CC3185	*TLD1700A	TRANSMITTER
C53RCB-1106A	60	C.S.	T1-R1	TONE	CC3185	*TLD1690A	POWER AMPLIFIER, 60-WATT
C53RCB-1115A	60	C.S.	T2-R1	DC	CC3185	*TLD1710A	POWER AMPLIFIER, 100-WATT
C53RCB-1116A	60	C.S.	T2-R1	TONE	CC3185	*TLD1710A	EXCITER-DRIVER
C53RCB-1125A	60	C.S.	T2-R2	DC	CC3185	KXN1019A	TRANSMITTER CHANNEL ELEMENT
C53RCB-1126A	60	C.S.	T2-R2	TONE	CC3185	*TRD1800AB	RECEIVER
C53RCB-1145A	60	C.S.	T2-2R	DC	CC3185	K1005A	RECEIVER CHANNEL ELEMENT
C53RCB-1146A	60	C.S.	T2-2R	TONE	CC3185	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RCB-3105A	60	"PL"	T1-R1	DC	CC3185	TLD8740A	SHIFTED IF KIT
C53RCB-3106A	60	"PL"	T1-R1	TONE	CC3185	TLN4758A	2-RECEIVER COUPLER
C53RCB-3115A	60	"PL"	T2-R1	DC	CC3185	TLN8799A	SERVICE BOARD
C53RCB-3116A	60	"PL"	T2-R1	TONE	CC3185	TLN4295A	ANTENNA SWITCH
C53RCB-3125A	60	"PL"	T2-R2	DC	CC3185	TLN4863A	HARDWARE, CABINET
C53RCB-3126A	60	"PL"	T2-R2	TONE	CC3185	THN6142A	CABINET
C53RCB-3145A	60	"PL"	T2-2R	DC	CC3185	TPN1095A	POWER SUPPLY, 60-WATT
C53RCB-3146A	60	"PL"	T2-2R	TONE	CC3185	TPN1096A	POWER SUPPLY, 100-WATT
C63/C73RCB-1105A	Δ	C.S.	T1-R1	DC	$\Delta\Delta$	TKN6563A	STATION INTERCABLING (1-RECEIVER STATIONS)
C63/C73RCB-1106A	Δ	C.S.	T1-R1	TONE	$\Delta\Delta$	TKN6571A	STATION INTERCABLING (2-RECEIVER STATIONS)
C63/C73RCB-1115A	Δ	C.S.	T2-R1	DC	$\Delta\Delta$	TLN4293B	"PL" ENCODER
C63/C73RCB-1116A	Δ	C.S.	T2-R1	TONE	$\Delta\Delta$	TLN6824A	"VIBRASENDER" RESONANT REED
C63/C73RCB-1125A	Δ	C.S.	T2-R2	DC	$\Delta\Delta$	TLN4294B	"PL" DECODER
C63/C73RCB-1126A	Δ	C.S.	T2-R2	TONE	$\Delta\Delta$	TLN8381A	"VIBRASPINDER" RESONANT REED
C63/C73RCB-1145A	Δ	C.S.	T2-2R	DC	$\Delta\Delta$	TCN1107A	REMOTE CONTROL CHASSIS
C63/C73RCB-1146A	Δ	C.S.	T2-2R	TONE	$\Delta\Delta$	TLN1245B	GUARD TONE DECODER MODULE
C63/C73RCB-3105A	Δ	"PL"	T1-R1	DC	$\Delta\Delta$	TLN1248A	C2-R2 TONE CONTROL MODULE
C63/C73RCB-3106A	Δ	"PL"	T1-R1	TONE	$\Delta\Delta$	TLN4635A	STATION CONTROL MODULE
C63/C73RCB-3115A	Δ	"PL"	T2-R1	DC	$\Delta\Delta$	TLN4638A	F1-"PL" TONE CONTROL MODULE
C63/C73RCB-3116A	Δ	"PL"	T2-R1	TONE	$\Delta\Delta$	TLN4658A	F1 TONE CONTROL MODULE
C63/C73RCB-3125A	Δ	"PL"	T2-R2	DC	$\Delta\Delta$	TLN4659A	F1-"PL" DC TRANSFER MODULE
C63/C73RCB-3126A	Δ	"PL"	T2-R2	TONE	$\Delta\Delta$	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
C63/C73RCB-3145A	Δ	"PL"	T2-2R	DC	$\Delta\Delta$	TLN4661A	F1 DC TRANSFER MODULE
C63/C73RCB-3146A	Δ	"PL"	T2-2R	TONE	$\Delta\Delta$	TLN4663A	C2-R2 DC TRANSFER MODULE
						TLN4665A	F2 TONE CONTROL MODULE
						TLN4669A	LINE DRIVER MODULE 2-WIRE 1-RECEIVER
						TLN4670A	LINE DRIVER MODULE 2-WIRE 2-RECEIVER

Δ C63 SERIES = 90 W
C73 SERIES = 100 W

$\Delta\Delta$ C63 SERIES = CC3193
C73 SERIES = CC3184

EPS-9134-D

MODEL	DESCRIPTION																							
																								TRANSMITTER
*TTDI700A																								TRANSMITTER 60 W
*TTDI690AA																								TRANSMITTER 90-110 W
KXN1019A																								TRANSMITTER CHANNEL ELEMENT RECEIVER
*TRDI800AB																								RECEIVER
K1005A																								RECEIVER CHANNEL ELEMENT
KXN1022A																								RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
TLD8740A																								SHIFTED IF KIT
TLN4758A																								2-RECEIVER COUPLER
																								MISCELLANEOUS
TLN8779A																								SERVICE BOARD
TLN4295A																								ANTENNA SWITCH
TLN4735A																								HARDWARE, CABINET
THN6141A																								CABINET
TPN1095A																								POWER SUPPLY
TKN6561A																								STATION INTERCABLING (1-RECEIVER STATIONS)
TKN6562A																								STATION INTERCABLING (2-RECEIVER STATIONS)
																								"PRIVATE-LINE"
TLN4293B																								"PL" ENCODER
TLN6824A																								"VIBRASENDER" RESONANT REED
TLN4294B																								"PL" DECODER
TLN8381A																								"VIBRASPOUNDER" RESONANT REED REMOTE CONTROL
TCN1107A																								REMOTE CONTROL CHASSIS
TLN1245B																								GUARD TONE DECODER MODULE
TLN1248A																								C2-R2 TONE CONTROL MODULE
TLN4635A																								STATION CONTROL MODULE
TLN4638A																								F1-"PL" TONE CONTROL MODULE
TLN4658A																								F1 TONE CONTROL MODULE
TLN4659A																								F1-"PL" DC TRANSFER MODULE
TLN4660A																								F2-R2 MUTE DC TRANSFER MODULE
TLN4661A																								F1-CS DC TRANSFER MODULE
TLN4663A																								C2-R2 DC TRANSFER MODULE
TLN4665A																								F2 TONE CONTROL MODULE
TLN4669A																								LINE DRIVER MODULE/2-WIRE 1-RECEIVER
TLN4670A																								LINE DRIVER MODULE/2-WIRE 2-RECEIVER

"A" SUFFIX MODELS

MOTOROLA

MODEL CHART
FOR
"MICOR" "COMPA-STATION"
BASE STATIONS-INTERMITTENT DUTY
"A" SUFFIX MODELS
132-174 MHz

CODE:

- ☒ = ONE ITEM SUPPLIED
- ② = TWO ITEMS SUPPLIED
- ① = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz \pm 30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.

* INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-1105A

- 5 = DC REMOTE CONTROL
- 6 = TONE REMOTE CONTROL
- 0 = T1-R1
- 1 = T2-R1
- 2 = T2-R2
- 4 = T2-2R (2 RECEIVERS)
- 1 = CARRIER SQUELCH
- 3 = "PRIVATE-LINE" TONE-CODED SQUELCH
- 5 = 60 W RF OUTPUT
- 6 = 90 W RF OUTPUT
- 7 = 110 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1 = ONE XMIT FREQ. T2 = TWO XMIT FREQS. R1 = ONE RCVR FREQ. R2 = TWO RCVR FREQS. 2R = TWO RCVRs - ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	MODEL	DESCRIPTION
C53RTB-1105A	60	CARRIER	T1-R1	DC	CC3181	*TTD1700A	TRANSMITTER 60 W
C53RTB-1106A	60	CARRIER	T1-R1	TONE	CC3181	*TTD1690AA	TRANSMITTER 90-110 W
C53RTB-1115A	60	CARRIER	T2-R1	DC	CC3181	KXN1019A	TRANSMITTER CHANNEL ELEMENT
C53RTB-1116A	60	CARRIER	T2-R1	TONE	CC3181		RECEIVER
C53RTB-1125A	60	CARRIER	T2-R2	DC	CC3181	*TRD1800AB	RECEIVER CHANNEL ELEMENT
C53RTB-1126A	60	CARRIER	T2-R2	TONE	CC3181	K1005A	RECEIVER CHANNEL ELEMENT
C53RTB-1145A	60	CARRIER	T2-2R	DC	CC3181	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RTB-1146A	60	CARRIER	T2-2R	TONE	CC3181	TLN8740A	SHIFTED IF KIT
C53RTB-3105A	60	"PL"	T1-R1	DC	CC3181	TLN4758A	2-RECEIVER COUPLER
C53RTB-3106A	60	"PL"	T1-R1	TONE	CC3181		MISCELLANEOUS
C53RTB-3115A	60	"PL"	T2-R1	DC	CC3181	TLN8799A	SERVICE BOARD
C53RTB-3116A	60	"PL"	T2-R1	TONE	CC3181	TLN4295A	ANTENNA SWITCH
C53RTB-3125A	60	"PL"	T2-R2	DC	CC3181	TLN4735A	HARDWARE, CABINET
C53RTB-3126A	60	"PL"	T2-R2	TONE	CC3181	TLN6141A	CABINET
C53RTB-3145A	60	"PL"	T2-2R	DC	CC3181	TPN1095A	POWER SUPPLY
C53RTB-3146A	60	"PL"	T2-2R	TONE	CC3181	TKN6561A	STATION INTERCABLING (1-RECEIVER STATIONS)
C63RTB-1105A	90	CARRIER	T1-R1	DC	CC3182	TKN6562A	STATION INTERCABLING (2-RECEIVER STATIONS)
C63RTB-1106A	90	CARRIER	T1-R1	TONE	CC3182		"PL" ENCODER
C63RTB-1115A	90	CARRIER	T2-R1	DC	CC3182	TLN4293B	"VIBRASENDER" RESONANT REED
C63RTB-1116A	90	CARRIER	T2-R1	TONE	CC3182	TLN6824A	"PL" DECODER
C63RTB-1125A	90	CARRIER	T2-R2	DC	CC3182	TLN4294B	"VIBRASPINDER" RESONANT REED
C63RTB-1126A	90	CARRIER	T2-R2	TONE	CC3182	TLN8381A	REMOTE CONTROL
C63RTB-1145A	90	CARRIER	T2-2R	DC	CC3182	TCN1107A	REMOTE CONTROL CHASSIS
C63RTB-1146A	90	CARRIER	T2-2R	TONE	CC3182	TLN1245B	GUARD TONE DECODER MODULE
C63RTB-3105A	90	"PL"	T1-R1	DC	CC3182	TLN1248A	C2-R2 TONE CONTROL MODULE
C63RTB-3106A	90	"PL"	T1-R1	TONE	CC3182	TLN4635A	STATION CONTROL MODULE
C63RTB-3115A	90	"PL"	T2-R1	DC	CC3182	TLN4638A	F1 "PL" TONE CONTROL MODULE
C63RTB-3116A	90	"PL"	T2-R1	TONE	CC3182	TLN4658A	F1 TONE CONTROL MODULE
C63RTB-3125A	90	"PL"	T2-R2	DC	CC3182	TLN4659A	F1 "PL" DC TRANSFER MODULE
C63RTB-3126A	90	"PL"	T2-R2	TONE	CC3182	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE
C63RTB-3145A	90	"PL"	T2-2R	DC	CC3182	TLN4661A	F1-CS DC TRANSFER MODULE
C63RTB-3146A	90	"PL"	T2-2R	TONE	CC3182	TLN4663A	C2-R2 DC TRANSFER MODULE
C73RTB-1105A	110	CARRIER	T1-R1	DC	CC3183	TLN4665A	F2 TONE CONTROL MODULE
C73RTB-1106A	110	CARRIER	T1-R1	TONE	CC3183	TLN4669A	LINE DRIVER MODULE/2-WIRE 1-RECEIVER
C73RTB-1115A	110	CARRIER	T2-R1	DC	CC3183	TLN4670A	LINE DRIVER MODULE/2-WIRE 2-RECEIVER
C73RTB-1116A	110	CARRIER	T2-R1	TONE	CC3183		
C73RTB-1125A	110	CARRIER	T2-R2	DC	CC3183		
C73RTB-1126A	110	CARRIER	T2-R2	TONE	CC3183		
C73RTB-1145A	110	CARRIER	T2-2R	DC	CC3183		
C73RTB-1146A	110	CARRIER	T2-2R	TONE	CC3183		
C73RTB-3105A	110	"PL"	T1-R1	DC	CC3183		
C73RTB-3106A	110	"PL"	T1-R1	TONE	CC3183		
C73RTB-3115A	110	"PL"	T2-R1	DC	CC3183		
C73RTB-3116A	110	"PL"	T2-R1	TONE	CC3183		
C73RTB-3125A	110	"PL"	T2-R2	DC	CC3183		
C73RTB-3126A	110	"PL"	T2-R2	TONE	CC3183		
C73RTB-3145A	110	"PL"	T2-2R	DC	CC3183		
C73RTB-3146A	110	"PL"	T2-2R	TONE	CC3183		

RTB "A" SUFFIX MODELS
MOTOROLA

MODEL CHART

FOR

"MICOR"® "COMPA-STATION"®

BASE STATIONS - INTERMITTENT DUTY

"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

- ☒ = ONE ITEM SUPPLIED
☐2 = TWO ITEMS SUPPLIED
☐0 = TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ±30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE A K1005A CHANNEL ELEMENT IS USED IN FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN SECOND RECEIVER. THE IF OF THE SECOND RECEIVER IS SHIFTED.
* = INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-6105A

- 5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL
0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)
6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 110 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1=ONE XMIT FREQ. T2= TWO XMIT FREQS. R1=ONE RCVR FREQ. R2= TWO RCVR FREQS. 2R= TWO RCVRS - ONE FREQ. EACH	CONTROL TYPE		MODEL	DESCRIPTION	
							TRANSMITTER	RECEIVER
						*TTD1700B	TRANSMITTER 60 W	
						*TTD1690BA	TRANSMITTER 90-110 W	
						KXN1019B	TRANSMITTER CHANNEL ELEMENT	
						*TRD1800BB	RECEIVER	
						K1005A	RECEIVER CHANNEL ELEMENT	
						KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)	
						TLN8740A	SHIFTED IF KIT	
						TLN4758A	2-RECEIVER COUPLER	
							MISCELLANEOUS	
						TLN8799A	SERVICE BOARD	
						TLN4295A	ANTENNA SWITCH	
						TLN4735A	HARDWARE, CABINET	
						THN6141A	CABINET	
						TPN1110B	POWER SUPPLY (FORMERLY TPN110A)	
						TKN6561A	STATION INTERCABLING (1-RECEIVER STATIONS)	
						TKN6562A	STATION INTERCABLING (2-RECEIVER STATIONS)	
							"DIGITAL PRIVATE-LINE"	
						TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER	
						TRN6005A	CODE PLUG	
						TLN5729A	"DIGITAL PRIVATE-LINE" DECODER	
							REMOTE CONTROL	
						TCN1107A	REMOTE CONTROL CHASSIS	
						TLN1245B	GUARD TONE DECODER MODULE	
						TLN1248A	C2-R2 TONE CONTROL MODULE	
						TLN4335B	STATION CONTROL MODULE	
						TLN4638A	F1 "PL" TONE CONTROL MODULE	
						TLN4658A	F1 TONE CONTROL MODULE	
						TLN4659A	F1 "PL" DC TRANSFER MODULE	
						TLN4660A	F2-R2 MUTE DC TRANSFER MODULE	
						TLN4661A	F1-CS DC TRANSFER MODULE	
						TLN4663A	C2-R2 DC TRANSFER MODULE	
						TLN4665A	F2 TONE CONTROL MODULE	
						TLN4669A	LINE DRIVER MODULE/2-WIRE 1-RECEIVER	
						TLN4670A	LINE DRIVER MODULE/2-WIRE 2-RECEIVER	
C53RTB-6105A	60	"DPL"	T1-R1	DC	CC3181		X	X
C53RTB-6106A	60	"DPL"	T1-R1	TONE	CC3181		X	X
C53RTB-6115A	60	"DPL"	T2-R1	DC	CC3181		X	2
C53RTB-6116A	60	"DPL"	T2-R1	TONE	CC3181		X	2
C53RTB-6125A	60	"DPL"	T2-R2	DC	CC3181		X	2
C53RTB-6126A	60	"DPL"	T2-R2	TONE	CC3181		X	2
C53RTB-6145A	60	"DPL"	T2-2R	DC	CC3181		X	2
C53RTB-6146A	60	"DPL"	T2-2R	TONE	CC3181		X	2
C63RTB-6105A	90	"DPL"	T1-R1	DC	CC3182		X	X
C63RTB-6106A	90	"DPL"	T1-R1	TONE	CC3182		X	X
C63RTB-6115A	90	"DPL"	T2-R1	DC	CC3182		X	2
C63RTB-6116A	90	"DPL"	T2-R1	TONE	CC3182		X	2
C63RTB-6125A	90	"DPL"	T2-R2	DC	CC3182		X	2
C63RTB-6126A	90	"DPL"	T2-R2	TONE	CC3182		X	2
C63RTB-6145A	90	"DPL"	T2-2R	DC	CC3182		X	2
C63RTB-6146A	90	"DPL"	T2-2R	TONE	CC3182		X	2
C73RTB-6105A	110	"DPL"	T1-R1	DC	CC3183		X	X
C73RTB-6106A	110	"DPL"	T1-R1	TONE	CC3183		X	X
C73RTB-6115A	110	"DPL"	T2-R1	DC	CC3183		X	2
C73RTB-6116A	110	"DPL"	T2-R1	TONE	CC3183		X	2
C73RTB-6125A	110	"DPL"	T2-R2	DC	CC3183		X	2
C73RTB-6126A	110	"DPL"	T2-R2	TONE	CC3183		X	2
C73RTB-6145A	110	"DPL"	T2-2R	DC	CC3183		X	2
C73RTB-6146A	110	"DPL"	T2-2R	TONE	CC3183		X	2

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N CARRIER

Y-CODED SQUELCH

FCC
LICENSE
DESIGNATION

C3193
C3184

MODEL		DESCRIPTION	
		TRANSMITTER	
	*TLD1700B	POWER AMPLIFIER, 50-WATT	
	*TLD1690B	POWER AMPLIFIER, 100-WATT	
	*TLD1710B	EXCITER-DRIVER	
	KXN1019B	TRANSMITTER CHANNEL ELEMENT	
		RECEIVER	
	*TRD1800BB	RECEIVER	
	K1005A	RECEIVER CHANNEL ELEMENT	
	KXN1022A	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)	
	TLN8740A	SHIFTED IF KIT	
	TLN4758A	2-RECEIVER COUPLER	
		MISCELLANEOUS	
	TLN8799A	SERVICE BOARD	
	TLN4295A	ANTENNA SWITCH	
	TLN4863A	HARDWARE, CABINET	
	THN6142A	CABINET	
	TPN1110B	POWER SUPPLY (FORMERLY TPN110-A)	
	TKN6563A	STATION INTERCABLING (1-RECEIVER STATIONS)	
	TKN6571A	STATION INTERCABLING (2-RECEIVER STATIONS)	
		"DIGITAL PRIVATE-LINE"	
	TTN6003A	"DIGITAL PRIVATE-LINE" ENCODER	
	TRN6005A	CODE PLUG	
	TLN5729A	"DIGITAL PRIVATE-LINE" DECODER	
	TLN5725A	"DIGITAL PRIVATE-LINE" ENCODER	
		REMOTE CONTROL	
	TCN1107A	REMOTE CONTROL CHASSIS	
	TLN1245B	GUARD TONE DECODER MODULE	
	TLN4355B	STATION CONTROL MODULE	
	TLN4638A	F1-"PL" TONE CONTROL MODULE	
	TLN4659A	F1-"PL" DC TRANSFER MODULE	
	TLN4660A	F2-R2 MUTE DC TRANSFER MODULE	
	TLN4663A	C2-R2 DC TRANSFER MODULE	
	TLN4665A	F2 TONE CONTROL MODULE	
	TLN4669A	LINE DRIVER MODULE 2-WIRE 1-RECEIVER	
	TLN4670A	LINE DRIVER MODULE 2-WIRE 2-RECEIVER	

EPS-18076-C

FACTORY-INSTALLED OPTIONS

OPTION PLAN NUMBER OR OPTIONAL KIT NUMBER	DESCRIPTION	PUBLICATION REFERENCE	
		SECTION WITHIN THIS MANUAL	SEPARATE PUBLICATION
TONE REMOTE CONTROL STATION OPTIONS			
C56AA	Mute R2	-	68P81025E60
OR			
C63AB	Paging Control Module	-	68P81025E60
TLN1249A	Squelch Control Module	-	68P81025E60
OR			
TLN1251A	"PL" Control Module	-	68P81025E60
OR			
TLN1250A	Repeater Control Module	-	68P81025E60
TLN1252A	"Wild Card" Module	-	68P81025E60
DC REMOTE CONTROL STATION OPTIONS			
C63AA	Paging Module	-	68P81025E60
C143	Repeater Control Module	-	68P81025E60
C146	Add Tone Control	Various	-
C150	Base (RA) Operation	-	68P81105E08
DC REMOTE CONTROL AND TONE REMOTE CONTROL STATION OPTIONS			
C06	Hi-Stability Ch. Element (Xmtr)	Exciter	-
C08	Hi-Stability Ch. Element (Rcvr)	RF & IF	-
C12	RF Preamplifier	Receiver Miscellaneous	-
C27	46" Outdoor Cabinet	Installation	-
C28	120 V, 60 Hz & +12 V DC	-	68P81104E92
C29	Battery Saver & Alarm	-	68P81104E92
C31	Transmit Only Station (omit receiver and use TKN6634A Station Interconnecting)	-	-
C32	12 V DC Power Interface	-	68P81105E31
C38	120/220/240 V, 50/60 Hz & +12 V DC	-	68P81104E92
C140	AND Squelch	Receiver Interconnect Unit	-
C144AA	4-Wire Audio (1-Rcvr)	-	68P81025E60
OR			
C144AB	4-Wire Audio (2-Rcvr)	-	68P81025E60
C145	TAC Encoder	-	68P81104E73
C149AT	Metering, Spkr. & Intercom	68P81033E28	-
C226	Service Intercom	-	68P81105E20
TLD6340A	Crystal Filter	-	68P81104A86 and 68P81104E36
TLN1181A	Single-Tone Decoder Module	-	68P81025E60
TLN1537A	Speaker & Intercom	-	68P81105E20
TLN4151A	Relay Kit	-	68P81025E60
TLN4636A	Time-Out Timer Module	-	68P81025E60

RCB "A" SUFFIX MODELS

MOTOROLA

MODEL CHART

FOR

"MICOR"® "COMPA-STATION"®

BASE STATIONS - CONTINUOUS DUTY

"DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH
132-174 MHz

CODE:

X

= ONE ITEM SUPPLIED

2

= TWO ITEMS SUPPLIED

0

= TWO K1005A RCVR ELEMENTS SUPPLIED UNLESS RECEIVER CARRIER FREQS. ARE SEPARATED BY 11.7 MHz ±30 kHz (OR A SUB-MULTIPLE THEREOF). IN THIS CASE, A K1005A CHANNEL ELEMENT IS USED IN THE FIRST RECEIVER AND A KXN1022A CHANNEL ELEMENT IS USED IN THE SECOND RECEIVER.

*

= INDICATES A SERIES OF MODELS. SPECIFIC MODEL DEPENDS UPON CARRIER FREQUENCY.

STATION MODEL VARIABLES

NOTE

STATION MODELS ARE NOT AVAILABLE FOR ALL POSSIBLE LETTER AND NUMBER COMBINATIONS.

C53RTB-6105A

5 = DC REMOTE CONTROL
6 = TONE REMOTE CONTROL

0 = T1-R1
1 = T2-R1
2 = T2-R2
4 = T2-2R (2 RECEIVERS)

6 = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

5 = 60 W RF OUTPUT
6 = 90 W RF OUTPUT
7 = 100 W RF OUTPUT

STATION MODEL	RF OUTPUT POWER (WATTS)	TYPE OF SQUELCH	T1=ONE XMIT FREQ. T2=TWO XMIT FREQS. R1=ONE RCVR FREQ. R2=TWO RCVR FREQS. 2R=TWO RCVRs-ONE FREQ. EACH	CONTROL TYPE	FCC LICENSE DESIGNATION	MODEL	DESCRIPTION	
							TRANSMITTER	RECEIVER
C53RCB-6105A	60	"DPL"	T1-R1	DC	CC3185	*TLD1700B	POWER AMPLIFIER, 60-WATT	RECEIVER
C53RCB-6106A	60	"DPL"	T1-R1	TONE	CC3185	*TLD1690B	POWER AMPLIFIER, 100-WATT	RECEIVER CHANNEL ELEMENT
C53RCB-6115A	60	"DPL"	T2-R1	DC	CC3185	*TLD1710B	EXCITER-DRIVER	RECEIVER CHANNEL ELEMENT (FOR 2ND RECEIVER SHIFTED IF)
C53RCB-6116A	60	"DPL"	T2-R1	TONE	CC3185	KXN1019B	TRANSMITTER CHANNEL ELEMENT	RECEIVER CHANNEL ELEMENT
C53RCB-6125A	60	"DPL"	T2-R2	DC	CC3185	*TRD1800BB	2-RECEIVER COUPLER	RECEIVER CHANNEL ELEMENT
C53RCB-6126A	60	"DPL"	T2-R2	TONE	CC3185	K1005A	SERVICE BOARD	RECEIVER CHANNEL ELEMENT
C53RCB-6145A	60	"DPL"	T2-2R	DC	CC3185	KXN1022A	ANTENNA SWITCH	RECEIVER CHANNEL ELEMENT
C53RCB-6146A	60	"DPL"	T2-2R	TONE	CC3185	TLN8740A	HARDWARE, CABINET	SHIFTED IF KIT
C63/C73RCB-6105A	Δ	"DPL"	T1-R1	DC	Δ Δ	TLN4758A	MISCELLANEOUS	2-RECEIVER COUPLER
C63/C73RCB-6106A	Δ	"DPL"	T1-R1	TONE	Δ Δ	TLN8799A	SERVICE BOARD	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6115A	Δ	"DPL"	T2-R1	DC	Δ Δ	TLN4295A	ANTENNA SWITCH	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6116A	Δ	"DPL"	T2-R1	TONE	Δ Δ	TLN4863A	HARDWARE, CABINET	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6125A	Δ	"DPL"	T2-R2	DC	Δ Δ	THN6142A	CABINET	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6126A	Δ	"DPL"	T2-R2	TONE	Δ Δ	TPN1110B	POWER SUPPLY (FORMERLY TPN110-A)	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6145A	Δ	"DPL"	T2-2R	DC	Δ Δ	TKN6563A	STATION INTERCABLING (1-RECEIVER STATIONS)	RECEIVER CHANNEL ELEMENT
C63/C73RCB-6146A	Δ	"DPL"	T2-2R	TONE	Δ Δ	TKN6571A	STATION INTERCABLING (2-RECEIVER STATIONS)	RECEIVER CHANNEL ELEMENT
							"DIGITAL PRIVATE-LINE"	
							"DIGITAL PRIVATE-LINE" ENCODER	
							CODE PLUG	
							"DIGITAL PRIVATE-LINE" DECODER	
							"DIGITAL PRIVATE-LINE" ENCODER	
							REMOTE CONTROL	
							REMOTE CONTROL CHASSIS	
							GUARD TONE DECODER MODULE	
							STATION CONTROL MODULE	
							F1-"PL" TONE CONTROL MODULE	
							F1-"PL" DC TRANSFER MODULE	
							F2-R2 MUTE DC TRANSFER MODULE	
							C2-R2 DC TRANSFER MODULE	
							F2 TONE CONTROL MODULE	
							LINE DRIVER MODULE 2-WIRE 1-RECEIVER	
							LINE DRIVER MODULE 2-WIRE 2-RECEIVER	

Δ C63 SERIES = 90 W
C73 SERIES = 100 W

Δ Δ C63 SERIES = CC3185
C73 SERIES = CC3185

EPS-18076-C

FACTORY-INSTALLED OPTIONS

OPTION PLAN NUMBER OR OPTIONAL KIT NUMBER	DESCRIPTION	PUBLICATION REFERENCE	
		SECTION WITHIN THIS MANUAL	SEPARATE PUBLICATION
TONE REMOTE CONTROL STATION OPTIONS			
C56AA OR C63AB	Mute R2	-	68P81025E60
TLN1249A OR TLN1251A	Paging Control Module	-	68P81025E60
TLN1251A OR TLN1250A	Squelch Control Module	-	68P81025E60
TLN1251A OR TLN1250A	"PL" Control Module	-	68P81025E60
TLN1250A OR TLN1252A	Repeater Control Module	-	68P81025E60
TLN1252A	"Wild Card" Module	-	68P81025E60
DC REMOTE CONTROL STATION OPTIONS			
C63AA	Paging Module	-	68P81025E60
C143	Repeater Control Module	-	68P81025E60
C146	Add Tone Control	Various	-
C150	Base (RA) Operation	-	68P81105E08
DC REMOTE CONTROL AND TONE REMOTE CONTROL STATION OPTIONS			
C06	Hi-Stability Ch. Element (Xmtr)	Exciter	-
C08	Hi-Stability Ch. Element (Rcvr)	RF & IF	-
C12	RF Preamplifier	Receiver	-
C27	46" Outdoor Cabinet	Miscellaneous	-
C28	120 V, 60 Hz & +12 V DC	Installation	-
C29	Battery Saver & Alarm	-	68P81104E92
C31	Transmit Only Station (omit receiver and use TKN6634A Station Intercabling)	-	68P81104E92
C32	12 V DC Power Interface	-	-
C38	120/220/240 V, 50/60 Hz & +12 V DC	-	68P81105E31
C140	AND Squelch	-	68P81104E92
C144AA OR C144AB	Receiver Interconnect Unit	-	-
C145	4-Wire Audio (1-Rcvr)	-	68P81025E60
C149AT	4-Wire Audio (2-Rcvr)	-	68P81025E60
C226	TAC Encoder	-	68P81104E73
TLN1252A	Metering, Spkr. & Intercom	68P81033E28	-
TLN1252A	Service Intercom	-	68P81105E20
TLN1252A	Crystal Filter	-	68P81105E20
TLN1181A		-	68P81104A86 and 68P81104E36
TLN1537A	Single-Tone Decoder Module	-	68P81104A86
TLN4151A	Speaker & Intercom	-	68P81025E60
TLN4636A	Relay Kit	-	68P81105E20
	Time-Out Timer Module	-	68P81025E60

MOTOROLA

MODEL CHART
FOR
CONTINUOUS DUTY
EXCITER-FILTER
AND
UNIFIED CONTROL CHASSIS
MODEL BREAKDOWN CHART

CODE:

☒ X = ONE INCLUDED

* = INDICATES ITEM COVERED IN CONTROL AND APPLICATIONS
MANUAL 68P81025E60.

[illegible]

EPS-2296

GENERAL SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic energy safety standard which applies to the use of this equipment. Proper use of this radio will result in exposure below the OSHA limit. The following precautions are recommended:

DO NOT operate the transmitter of a mobile radio when someone outside the vehicle is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of a fixed radio (base station, microwave and rural telephone rf equipment) or marine radio when someone is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

In addition,

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly grounded according to Motorola installation instructions for safe operation.

All equipment should be serviced only by a qualified technician.

Refer to the appropriate section of the product service manual for additional pertinent safety information.

EPS-28750-O

DESCRIPTION

132-174 MHz "MICOR"
"COMPA-STATION" BASE
REPEATER RADIO

DESCRIPTION

1. ELECTRICAL FEATURES

Motorola "Micor" "Compa-Station" base and repeater FM two-way radios are fully solid-state units incorporating integrated circuits. Highly reliable reed switches are used for antenna switching in base stations.

All the advantages of solid-state and integrated circuit technology are utilized:

Reliability. -- Components have long life and require less maintenance.

Low current drain. -- Little power is consumed except when expending usable power such as receiving audio or transmitting rf signals. High efficiency means less power is consumed during these conditions.

Less heat. -- No filament heating is required, thus the radio operates cooler.

Small size. -- Small component size provides a high power radio in a small package, yet allows plenty of space for ease of servicing and room for many optional or future circuits to be added.

Low Voltage. -- The highest dc voltage required by the station, including the high power rf amplifiers, is 13.6 volts. This provides safety from electrical shock for the maintenance technician.

All stations require 60 Hz, 120-volt ac power and operate in the 132-174 MHz frequency range. Models are available for one-or two-

frequency operation, and with transmitter power outputs of 60, 90, 100 and 110 watts. In all models, the receiver provides 10 watts of audio at less than 5% distortion into an 8-ohm load.

Unheated, temperature compensated, plug-in, oscillator modules (channel elements) are used for frequency control. Blowers and their related maintenance problems are eliminated by the use of heat sinks in the transmitter amplifier stages. Continuous duty transmitters can operate at full rated power indefinitely -- intermittent duty transmitters operate at full rated power under a 20% duty cycle or up to one minute ON immediately followed by four minutes OFF. Should an intermittent duty transmitter be keyed long enough to cause the station temperature to rise, a temperature sensing circuit in the transmitter reduces transmitter output power proportionally. This allows the station to remain "on-the-air" (at reduced power) even though the duty cycle of the station has been greatly exceeded. Continuous duty transmitters do not require and do not include this temperature power "cutback" feature.

2. MECHANICAL & SERVICING FEATURES

--Excellent Access - Virtually all components are mounted on circuit boards which are easily removed and replaced without unsoldering leads. The transmitter receiver, remote control unit and power supply are on individual "shelves".

--Few Wires - Broken and loose wire connections are greatly reduced as a source of trouble. A single 50-conductor "flat cable" interconnects the transmitter, receiver, and remote control unit.



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60172

-- Modular Construction - Circuit boards can be removed and replaced in seconds. Spare circuit boards may be carried by a technician and defective boards replaced to quickly return stations to service.

-- Integrated Circuits - Fewer components and more reliable components mean less servicing.

-- Five Metering Receptacles - Metering receptacles in the exciter, power amplifier, power control board, receiver and remote control unit allow a Motorola portable test set to check over 20 major test points for rapid isolation of trouble. A microphone may be connected to the test set and the speaker in the test set used for operation of the station during testing. If optional built-in station metering is used, these functions can be checked at any time without the use of a portable test set.

-- Alignment - All receiver and transmitter alignment is performed from the front of the station. Crystal filters in the receiver i-f section eliminate most i-f alignment adjustments. Transmitter power output may be measured with optional built-in station metering or on a Motorola portable test set; no additional test equipment is required for transmitter alignment.

3. APPLICATION

Refer to CONTROL AND APPLICATION manual 68P81025E60, which accompanies this manual, for applications data.

4. "PRIVATE-LINE" OPERATION

This type of station is an improvement in FM two-way radio equipment especially when operating under crowded channel conditions. Several "Private-Line" systems can use the same rf carrier frequency in the same area if each system uses a different "Private-Line" code.

The transmitters are modulated by a continuous code signal in addition to the voice modulation. The receivers accept only correctly code-modulated signals and reject all others.

"Private-Line" coded squelch models also include noise-actuated squelch circuitry. This enables the operator to monitor the channel before transmissions ("PL" disable) and prevent interference with other users of the frequency.

The SQUELCH control has no effect on "PL" squelch sensitivity. In normal operation ("PL" ON), the receiver audio is activated when the on-frequency rf signal is FM modulated with the proper "PL" code to activate the "Private-Line" decoder.

Either one of two types of "Private-Line" coded squelch may be used; tone-coded or binary-coded. In "Private-Line" tone-coded squelch systems, 67-210 Hz tones are transmitted and then detected to unsquelch the audio path in a particular receiver or group of receivers. In "Digital Private-Line" binary-coded squelch systems, a 23-bit binary code word is transmitted continuously and detected to unsquelch the audio path in the receiver(s). Both the tone code and the binary code rate fall below the 300-3000 Hz voice frequency range used in radio communications equipment, therefore, the code signals are not heard by the operator.

5. DESCRIPTION OF ITEMS

a. Transmitter

The transmitter generates a frequency modulated rf carrier signal of 60-, 90-, 100-, or 110 watts depending upon the model. Refer to the following station block diagram for functional operation. The transmitter consists of the following items:

-- Channel Element - An unheated, temperature-compensated crystal oscillator plug-in module (channel element) provides a stable fundamental rf frequency for the transmitter. One channel element is used for each transmitter frequency. One- and two-frequency stations are available as standard remote models.

-- Exciter - The exciter provides the low power excitation signal for the transmitter. An "IDC" (Instantaneous Deviation Control) circuit amplifies and limits audio signals from the microphone (or line) to prevent over deviation. Amplified audio is applied to the channel element to produce direct fm modulation. Multipliers in the exciter multiply the channel element frequency 12 times to generate the carrier frequency signal(s) in the 132-174 MHz band.

-- Bandpass Filter - The bandpass filter couples 132-174 MHz signals from the exciter to the power amplifier and attenuates any harmonics outside this band.

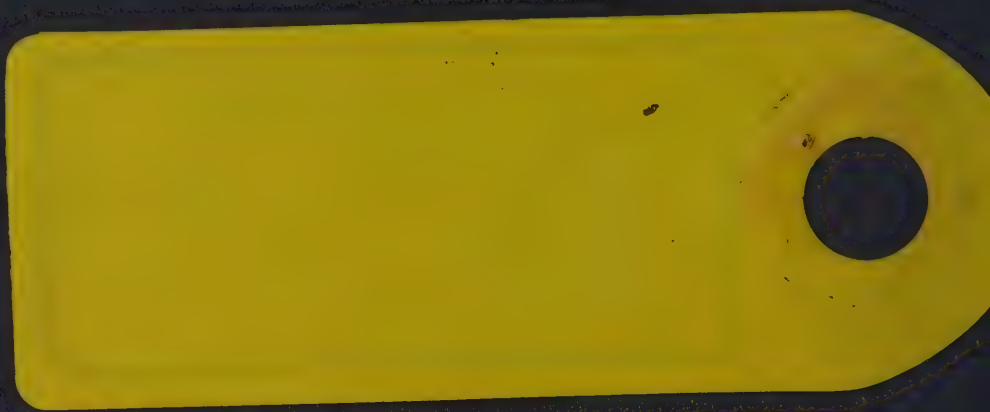
-- Power Amplifier - The lower power output of the exciter is amplified to the rated power

**POISON/DANGER
CAUSES SEVERE BURNS**

Contains sulfuric acid. Avoid contact with skin, eyes or clothing.
Antidote: EXTERNAL: Flush with water. INTERNAL: Drink large
quantities water or milk. Follow with meals of magnesium hydroxide
egg or veg. oil. Call physician immediately. Eyes: Flush with water
for 15 minutes and get prompt medical attention.

Batteries produce **EXPLOSIVE GASES**. Keep sparks, flame, ca-
igarettes away. Ventilate when charging or using in enclosed space.
Always shield eyes when working near batteries.

KEEP OUT OF REACH OF CHILDREN



output of the transmitter in this solid-state power amplifier. Class C amplifiers are used which are cut off until signal drive is applied. A controlled amplifier stage regulates the amount of signal drive to prevent over-dissipation in the final amplifier stages. An input from the power control board controls the amount of gain.

-- Harmonic Filter - The low pass harmonic filter passes the 132-174 MHz band carrier signal and attenuates all harmonics from being radiated.

-- Power Control Board - The Power Control Board automatically and instantaneously regulates the transmitter output power. It maintains output power should source voltage vary, and progressively reduces power when temperature (intermittent duty models only) or VSWR increase. The output of the board is applied to the controlled amplifier stage in the power amplifier to regulate the amount of gain.

b. "Micor" "Compa-Station" "Sensitron"
Receiver

The receiver accepts rf carrier signals on a specific channel in the 132-174 MHz range and provides voice audio in the 300-3000 Hz range. Refer to the station block diagram for functional operation. The receiver consists of the following items:

-- Channel Element - A plug-in crystal oscillator module (channel element) provides stable frequency control for each frequency of operation. One- and two-frequency stations are available as standard remote models.

-- Receiver RF & IF Board - The single-conversion superheterodyne FM receiver includes five rf preselectors (tuned cavities) and two crystal filters for excellent selectivity. Two integrated circuit i-f amplifiers and limiters give high sensitivity. A crystal discriminator demodulates the audio directly from an 11.7 MHz i-f signal. (Some 2-receiver stations may have a "shifted i-f" to 11.8 MHz when required.)

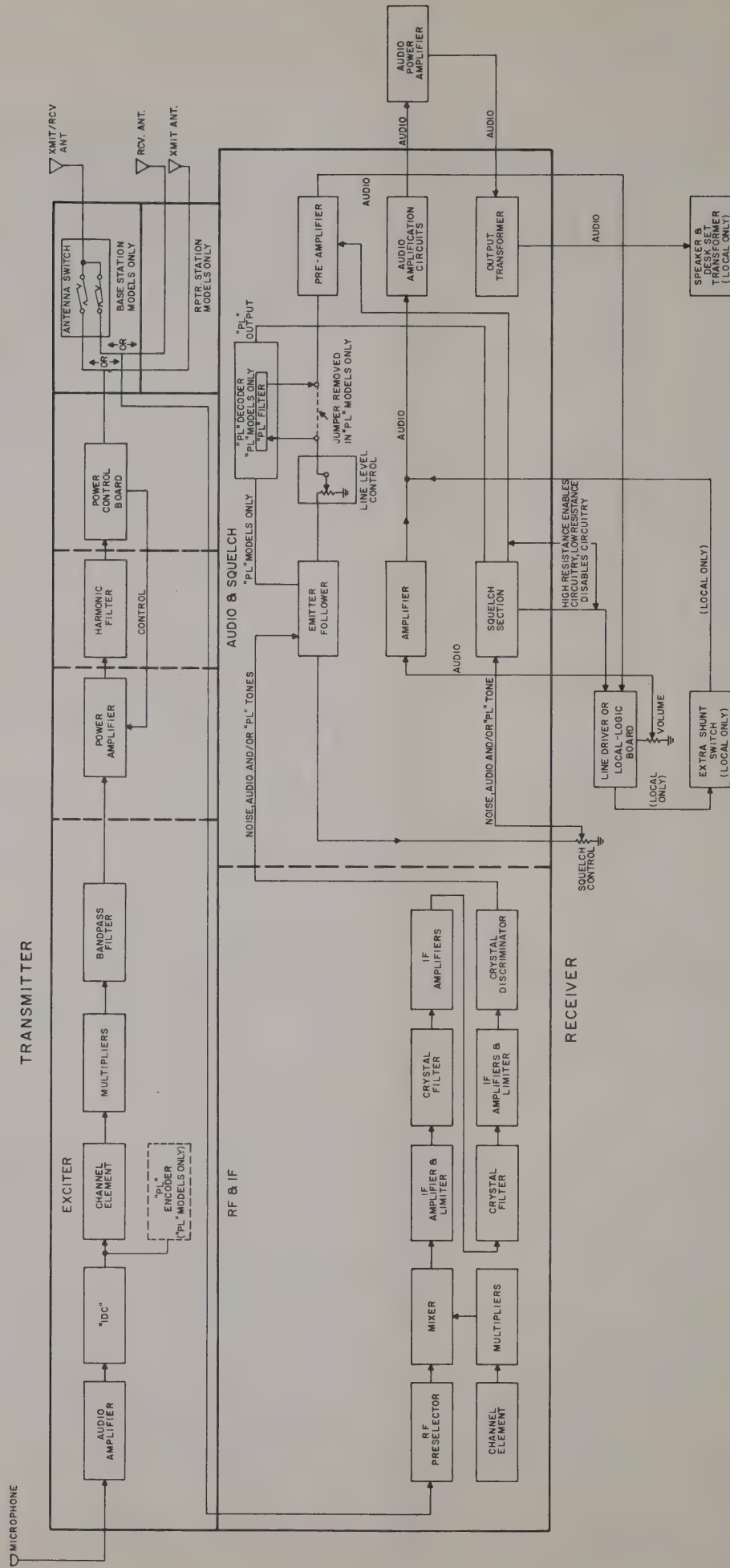
-- Audio & Squelch and Audio Power Amplifier Boards - Up to 10 watts of audio power at less than 5% distortion is provided by this circuit. When no messages are being received, the squelch circuit turns off the audio amplifiers to eliminate annoying noise in the speaker. A squelch tail eliminator circuit prevents the noise burst at the end of a message for strong signals. For weak signals, the circuit is automatically inhibited to prevent loss of portions of messages. The audio power amplifier transistors are mounted on a separate circuit board and aluminum heat sink for good heat dissipation.

With 2-receiver stations, a 2-receiver coupler is used. This unit permits two receivers to operate from the same antenna.

An optional receiver rf preamplifier is also available to improve receiver sensitivity by 6 dB to .125 microvolt. When used with 2-receiver stations, this more than makes up for the half power loss in each "leg" of the 2-receiver coupler.

c. Power Supply

The power supply provides all the voltage necessary for operating the station.



Station Block Diagram

INSTALLATION

IMPORTANT

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.
3. Frequency, deviation and power of a base station transmitter must be checked before it is placed in service and rechecked every year thereafter.

REMEMBER

The efficiency of the equipment depends upon a good installation.

1. INSPECTION

Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

2. PLANNING THE INSTALLATION

Since a good installation is so important to obtain the best possible performance of the communications system, carefully plan the installation before actual work is started. Location of the station in relation to power, control lines, the antenna,

convenience and access for servicing should be considered. The cabinet dimensional detail diagrams show the size of the various cabinets for planning the space requirements. Read the entire procedure and the many suggestions offered to help you plan your installation. Make sure all tools, equipment and facilities are available when the installation is begun.

3. VENTILATION

The radio equipment is operated without forced ventilation. The cabinets have vents which allow outside air to be drawn in through an opening in the bottom of the doors and expelled through an opening in the top of the doors. The heated air rising in the cabinet causes a natural draft. Therefore, it is essential that the openings be kept free of obstructions so the air flow will not be restricted. The vents on outdoor type cabinets provide necessary station ventilation and in addition prevent rain, snow, etc. from entering the cabinet.

4. INSTALLATION OF CABINET

a. General

The cabinet should be located on a solid, level surface convenient to the power source and the transmission line. The transmission line should be kept as short as possible to minimize line losses.

5. CONNECTIONS

All antenna, power and control lines may be brought through the notch at the bottom of the rear door (indoor "Compa-Station" cabinets). Any or all of these lines may be brought out through the bottom, side or top of the cabinet, if desired, by drilling a hole in the cabinet at the desired position.

INSTALLATION



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

Be careful to determine internal clearance before drilling access holes. A 3/4-inch diameter hole allows conduit to be installed for cable runs. If conduit is not used, install rubber grommets in the holes to protect the cables. For outdoor installations, the entrance point(s) must be sealed and made as weatherproof as possible.

a. Antenna

Installation of the antennas and transmission lines should be made prior to installation of the station. The antennas and transmission lines are not supplied as part of the station equipment; therefore, antenna installation instructions are not included herein. Follow the instructions shipped with the antennas for applicable antenna installation procedures.

In its primary application, the station is used for communication with mobile stations. Antennas exhibiting omni-directional characteristics are desirable. However, if the station is located at the outer perimeter of a communications area or if it is to be used for communications with fixed stations, antennas with specific directional characteristics may be more suitable. FCC requirements may also dictate the type of antenna to be used.

For base stations, the antenna coaxial cable connects to the antenna relay with a UHF type connector. The antenna relay is located on the left end of the receiver chassis in the rear of the station, with the antenna connection pointed downward (see Figure 1). If the antenna cable is to be routed out the top of the cabinet, the antenna relay can be moved to the transmitter or exciter chassis and inverted so that the antenna connection is pointed upward.

For models using unified control chassis, the antenna relay is located at the rear of the transmitter portion (see Figure 1).

For repeater stations, one or two antenna(s) may be used. Two antennas are required if the station is not equipped with a duplexer unit -- one for the transmitter and the other for the receiver. Connect the transmitter antenna coaxial cable to the BNC type connector on the right of the transmitter chassis in the front of the station. Connect the receiver antenna coaxial cable to the BNC type connector on the receiver chassis. Only one antenna is required if the station is equipped with a duplexer unit. Connect the antenna coaxial cable to the duplexer unit with a UHF type connector. This connector is located on top of the duplexer unit and is reached from the rear of the station.

b. Jumpers to Set Before Operation

Many station modes of operation are determined by jumper connections at the time of installation and are described in the following paragraphs.

Additional jumpers used with the station are identified and described in applicable sections elsewhere within this instruction manual.

(1) Time-Out Timer Module

Base stations or repeaters equipped with a time-out timer module prevent unintentional continuous transmission. The timing jumpers on the module may be connected for 1/2, 1, 2, 4 or 8 minute operation. In repeaters, the time-out timer will reset each time a new input signal arrives at the station, whether or not the dropout delay generator has shut off the transmitter. Repeater time-out time and line transmit time periods may be selected independently with the repeater select jumper and the line select jumper.

(2) Squelch Gate

In repeater stations, the dropout delay generator in the squelch gate module prevents the transmitter from shutting off during loss or excessive fade of input signal for the length of time preset. The jumper can be set for 0, 1, 2, 4 or 8 seconds operation.

(3) Two-Receiver Stations

Stations equipped with two receivers can be connected for receiver #1 priority or receiver #2 priority if desired. A signal received on the priority receiver automatically mutes the other receiver. These jumpers are located on the line driver module.

Receiver #1 priority - JU18 OUT
JU24 IN
Receiver #2 priority - JU18 IN
JU24 OUT

Jumpers in the line driver module also allow receiver #2 to be partially muted (audio attenuation) if desired, rather than the full muting as shipped from the factory. Attenuation of 10 dB, 20 dB or 30 dB in respect to the unmuted condition are possible by jumper connections as follows.

10 dB attenuation - JU25, 26 IN
JU27 OUT
20 dB attenuation - JU25 IN
JU26, 27 OUT
30 dB attenuation - JU25, 26 & 27 OUT

Receiver #2 mute attenuation is a standard feature of DC controlled stations and optional on Tone Control.

c. Power Connections

All stations may operate a 20-ampere, 120 volt 60 Hz ac power input. This circuit should be installed in accordance with local electrical codes.

The primary ac power line can be installed and terminated near the station site before installing the station cabinet. If the 3-wire line cord (supplied with the station) is used, the ac power line should be terminated with a 3-contact receptacle to accommodate the plug on the power cord.

Connect the three-wire ac line cord to the ac outlet or "turn on" the power to the permanent connection. A power on-off switch is not provided in the equipment, therefore, with power applied, the equipment is in an operative condition.

The station fuse controls all power to the station except ac power to the outlet in the power supply.

WARNING

If a three wire grounded primary ac power source is not available the radio equipment must be grounded separately to prevent electrical shock hazards and provide lightning protection.

d. Control Line

The station can be controlled from a remote point over wire line circuits. Simplex audio is used, meaning that the remote point can send audio to the station or receive audio from the station, but not both at the same time. Therefore, a single audio pair will suffice. For dc remote control operation, the wire line must provide dc continuity for carrying the dc control currents. This must be the same pair that carries the transmit audio. For tone remote control operation the audio pair also carries the audio control tones.

Four-wire audio operation, wherein transmitter audio and receiver audio are carried on separate wire pairs, is possible with the optional Line Driver/4-wire, 2-receiver Audio Module (this module is also used in 4-wire, single receiver application). In such operation, line 1 is the transmit pair and line 2 is the receive pair.

In stations with two receivers and four-

wire audio, jumpers can be arranged to use line 2 to carry the audio from receiver #2 only if desired.

The audio wire line(s) must meet the following specifications for acceptable radio communications. For stations using both tone and dc control, the lines must meet both specifications.

TONE REMOTE CONTROL OPERATION AUDIO LINE REQUIREMENTS

PHONE-COMPANY SPECIFIED MAXIMUM INPUT	MAXIMUM PHONE LINE LOSS USABLE WITH RE- MOTELY-CONTROLLED RADIO
+8 vu (14 dBm)	32 dB
0 vu (6 dBm)	24 dB
-8 vu (-2 dBm)	16 dB

FREQUENCY RESPONSE: 500 to 2500 Hz
FREQUENCY TRANSLATION ERROR: ± 10 Hz MAX.
IMPEDANCE: 600-OHM BALANCED LINE
SIGNAL-TO-NOISE: 35 dB MIN.

DC REMOTE CONTROL OPERATION

AUDIO LINE REQUIREMENTS

1. FREQUENCY RESPONSE:
500 TO 2500 Hz
2. IMPEDANCE:
600-OHM BALANCED LINE

DC LINE REQUIREMENTS

1. DC RESISTANCE 0 TO 8000 OHMS.
2. MUST HAVE DC CONTINUITY.

CHARACTERISTICS OF LEASED TELEPHONE LINES SHOULD BE CHECKED WITH THE COMPANY PROVIDING THE SERVICE PER THE ABOVE REQUIREMENTS.

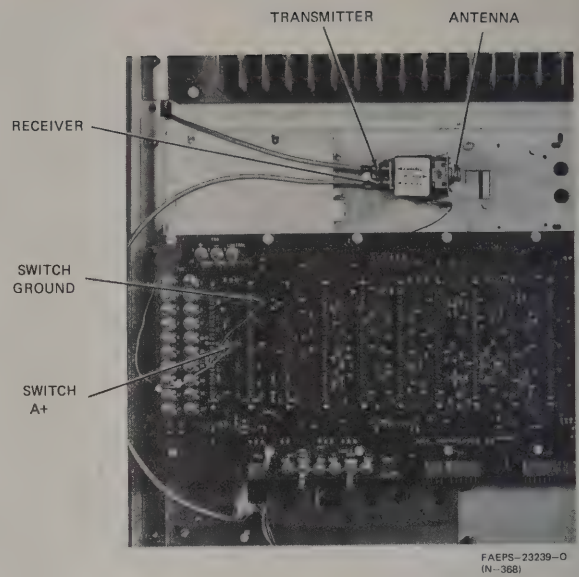
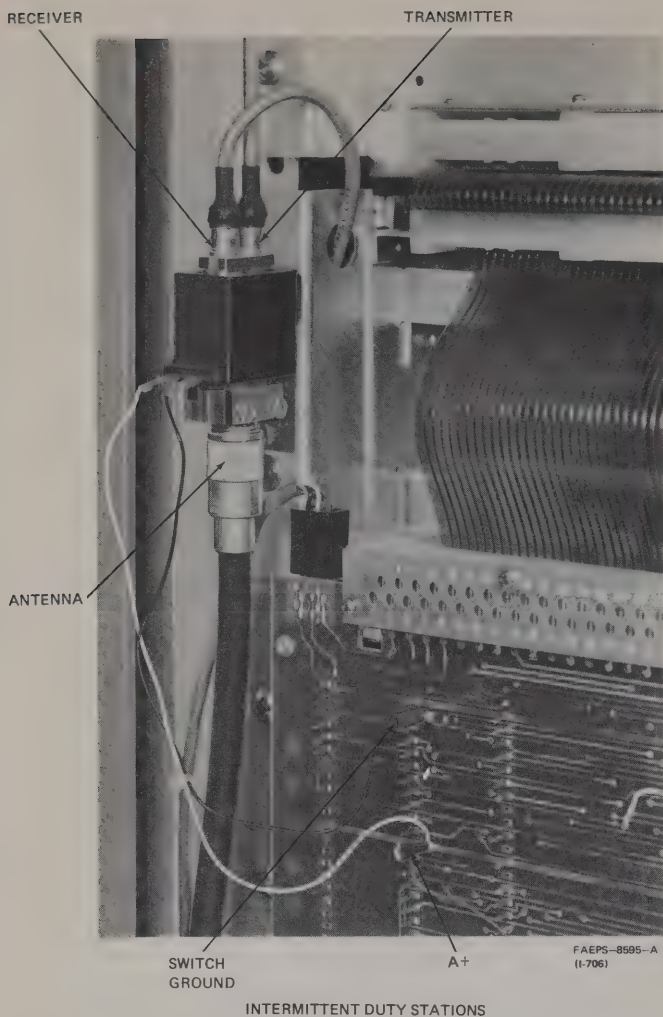
The control line may be installed prior to installation of the cabinet and terminated near the location chosen for the station. Conduit or two-wire cable can be used from this termination to the station cabinet.

Connect the 600-ohm lines to the screw terminals on the rear of the remote control chassis interconnect board as shown in Figure 2 (in 2-wire applications, use line 1 connections).

6. PRE-OPERATIONAL ADJUSTMENTS

a. General Information

Most telephone companies limit the maximum signal power which they will allow on their lines. This maximum is specified with respect



CONTINUOUS DUTY STATIONS
(WITH UNIFIED CONTROL CHASSIS)

Figure 1. Antenna Relay Location

to a specified Test Level Point (TLP) at full system deviation (± 5 kHz). The maximum signal power usually specified (in the U.S.A.) is -13 dB average below the TLP. The -13 dB average is defined as the peak to average ratio of a speech signal over a 3-second period. For purposes of these instructions, the TLP is assumed to be 0 dBm for voice and -16 dBm for multiplex unless otherwise specified.

Since it is difficult (if not impossible) to measure speech power, a test tone (sine wave) is used for setting line levels. A 1000 Hz tone set for 60% of full system deviation (± 3.0 kHz) is recommended for setting the line level.

b. DC Line Current

When the dc control line is initially connected, it must be tested to assure that its loop resistance is low enough to allow sufficient current for remote operation. Use the following test procedure:

(1) Connect a dc millimeter in series with the dc control line.

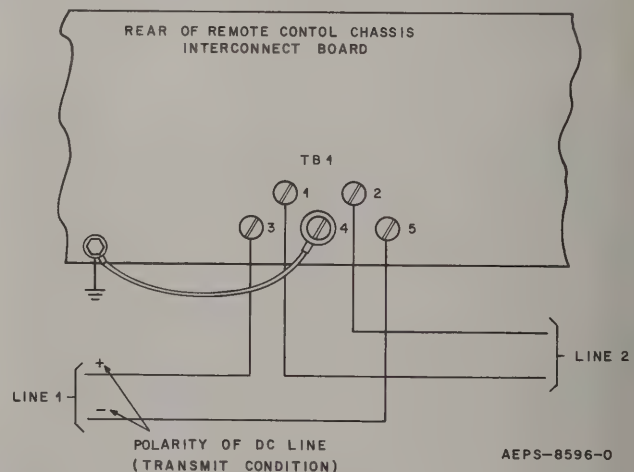


Figure 2. Control Line Connections

(2) Press the push-to-talk switch at the remote control console.

(3) The current must be at least +5.5 mA to key the transmitter; at least +10 mA for two-frequency transmitters. Check the current polarity and note whether the station is actually

keyed; reverse the polarity of the line connections if necessary. Adjust the remote control console for F1 line current until +5.5 mA is achieved. For a two-frequency transmitter, adjust the remote control console for F2 line current of 10 to 12 mA. If the loop resistance is too high, the line current with the console set for maximum current will not key the transmitter. There are two alternatives:

--Use a lower resistance pair of lines.

--Use an alternate pair of lines with lower resistance to carry dc current only. This pair need not have good audio loss or response characteristics.

Adjust the line current for "Private-Line" disable at the remote control console for -2.5 mA, if a "Private-Line" model is being adjusted.

c. Control Tone Levels

The control tone levels for the remotely controlled functions are adjusted at the remote control console. No additional adjustments are required.

d. Audio Level Settings

(1) General

(a) A local speaker at the station may be used for testing and level settings. If the station is equipped with optional built-in metering, it includes a local speaker. If not, the speaker in a Motorola portable test set may be used by connecting the test set with "Micor" adapter to the control receptacle (J3) on the remote control interconnect board. Otherwise, a "Micor" mobile speaker can be connected to the local speaker pins (J4-1 and -12 of remote control interconnect board). The receiver VOLUME control sets the audio level at the local speaker only.

(b) Exciter audio should be measured at the microphone input to the exciter (J902-12 and -19) and adjusted for the sensitivity value stamped on the exciter. If the station is equipped with optional built-in metering, this may be measured at pins 1 and 2 of the local microphone jack. If not, it may be measured at J4-15 and -14 of remote control interconnect board or on the portable test set.

(c) "Private-Line" receivers must be PL disabled during adjustments with the PL DISABLE switch on the station control module. In "Private-Line" repeaters, the squelch gate must also be set for carrier squelch operation during adjustments by connecting jumper JU14 to the active pin and JU15 to the dummy pin. Be sure to return the jumpers to the PL condition after adjustments are complete.

(d) If the station is equipped with a single-tone decoder module for repeater access unplug the single-tone decoder during adjustments.

(2) Repeater Level Setting

(a) Set the receiver SQUELCH control at squelch threshold.

(b) Inject an on-frequency carrier signal into the receiver antenna input. Adjust the signal level for 20 dB quieting.

(c) Adjust the REPEATER SQUELCH KEY control (squelch gate module) so the transmitter just keys.

(d) Modulate the receiver input with a 1000-Hz tone at ± 5 kHz deviation. Adjust the REPEATER LEVEL control (squelch gate module) so the exciter audio input is the value stamped on the exciter (modulator sensitivity +6 dB).

(3) Wire Line Controlled Base Stations and Repeaters

Determine the maximum allowable audio level permitted on the lines (usually 0 dBm) and set line audio levels to this amplitude.

As mentioned previously, the lines used to carry audio have an ac impedance of 600 ohms. The amplitude of signals is most conveniently measured in dBm. Zero dBm is equal to 1 milliwatt across 600 ohms. Most audio voltmeter, such as the Motorola Transistorized AC Voltmeter, are calibrated to read directly in dBm when measuring across a 600-ohm impedance. Never use a volt-ohm meter or a multimeter.

(a) Apply a 1000-Hz test tone at the remote control console which will drive the amplifier into compression. Adjust the output of the remote control console for +14 dBm (or maximum allowable audio level on the transmit audio line as it leaves to remote control console. If the level at TB1-3 & 5 (TB1-1 and -3 on unified chassis) is above 0 dBm remove JU1 on the station control module.

(b) Adjust the XCTR LEVEL control (station control module) so the exciter audio input equals the value stamped on the exciter (modulator sensitivity plus 6 dB).

(c) Remove the transmit audio tone.

(d) Set the receiver SQUELCH control for squelch threshold.

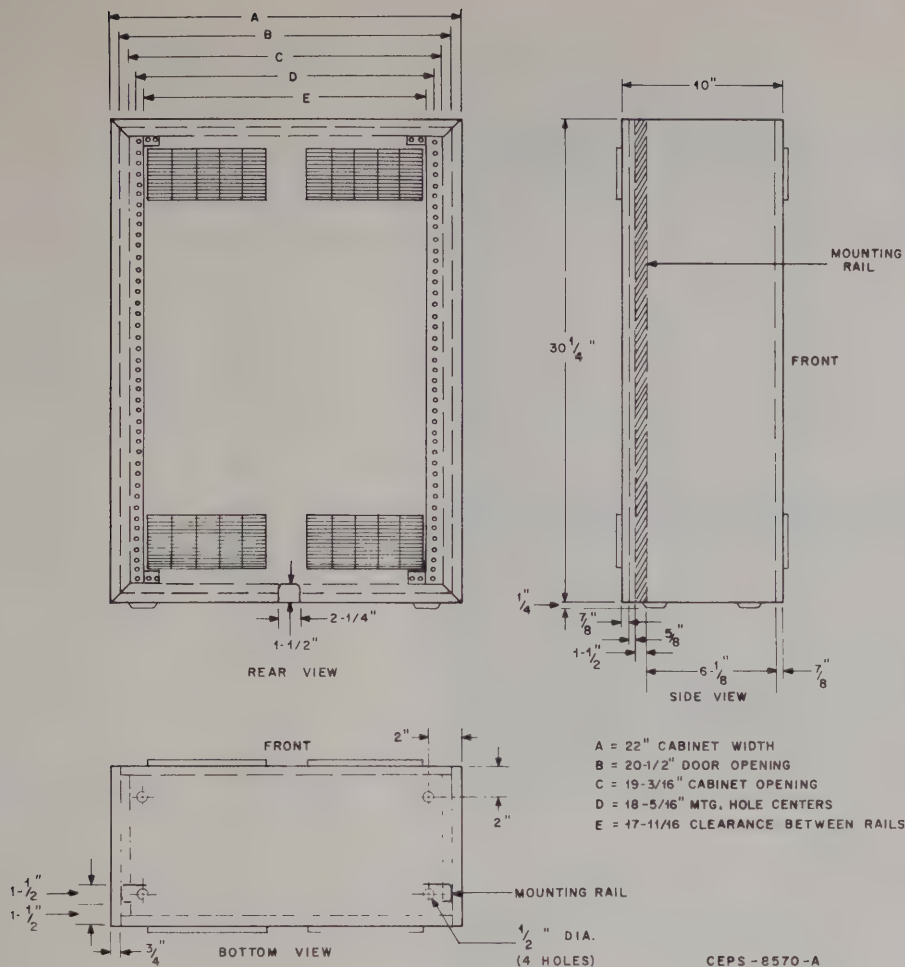
(e) Inject a 1000 uV carrier frequency signal at the antenna input of the receiver. Modulate the signal with a 1000 Hz tone at ± 3 kHz deviation.

(f) Adjust the LINE 1 OUTPUT (line driver module) for 4.4 dBm below the specified TLP as measured with an rms voltmeter across the line 1 terminals at TB1-3 and -5 (TB1-1 and -3 on unified chassis). If four-wire audio operation is used, with the receiver output applied to line 2, adjust the LINE 2 OUTPUT control while measuring across the line 2 terminals at TB1-1 and -2 (TB1-6 and -4 on unified chassis).

If the station has two receivers, both feeding to line 1, set the LINE 1 OUTPUT control as specified with a ± 5 kHz modulated

carrier signal injected into receiver 1. Next, inject a ± 5 kHz modulated carrier into receiver 2. If the line output on the voltmeter changes by more than 2 dBm, readjust the potentiometer on the receiver 2 audio and squelch board to match the receiver 1 reading.

If the station has two receivers, each on a different line, adjust LINE 1 OUTPUT with a modulated carrier injected into receiver 1, and adjust LINE 2 OUTPUT with a modulated carrier injected into receiver 2.



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN4859A Cabinet Hardware Kit
(intermittent-duty repeater stations) PL-1789-A

NON-REFERENCED ITEMS		
2D82360B07 3S135038	SPEED NUT; 22 req'd. SCREW, tapping; 14 x 3/4" Phillips pan head; 22 req'd.	
13B813618	DECAL; patents	
54A850440	LABEL; FCC license designation	
54A84857B01	LABEL; power output calibration	
54A83040C01	LABEL; exciter audio	
54A842366	LABEL; replacement parts	
33B83751C01	NAMEPLATE; model number	
15C84255D01	COVER; top	
15C84254D01	COVER; rear	
15C84253D01	COVER; front; receiver	
3S136890	SCREW, machine; 4-40 x 1/4" plain hex head; 20 req'd.	
3A84141D01	SCREW; special type; 16 req'd.	
15D84353D01	COVER; bottom; transmitter	
15D84352D01	COVER; rear; transmitter	
15D84301E01	COVER; front; transmitter, h. b.	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN4735A Cabinet Hardware Kit (Base Stations) PL-1788-B

NON-REFERENCED ITEMS		
2D82360B07 3S135038	SPEED NUT (22 required) SCREW, tapping: No. 14 x 3/4" Phillips pan head (22 required)	
7B84266D01 3S131965	BRACKET (antenna relay mounting) SCREW, tapping: 8-32 x 3/8" Phillips hex head with captive lockwasher (2 required)	
3S135841	SCREW, tapping: 6-32 x 1" Phillips hex head (2 required)	
13R813618	DECAL (patents)	
54A850440	LABEL (FCC license designation)	
54A84857B01	LABEL (power output calibration)	
54A83040C01	LABEL (exciter audio)	
54A842366	LABEL (replacement parts)	
33B83751C01	NAMEPLATE (model number)	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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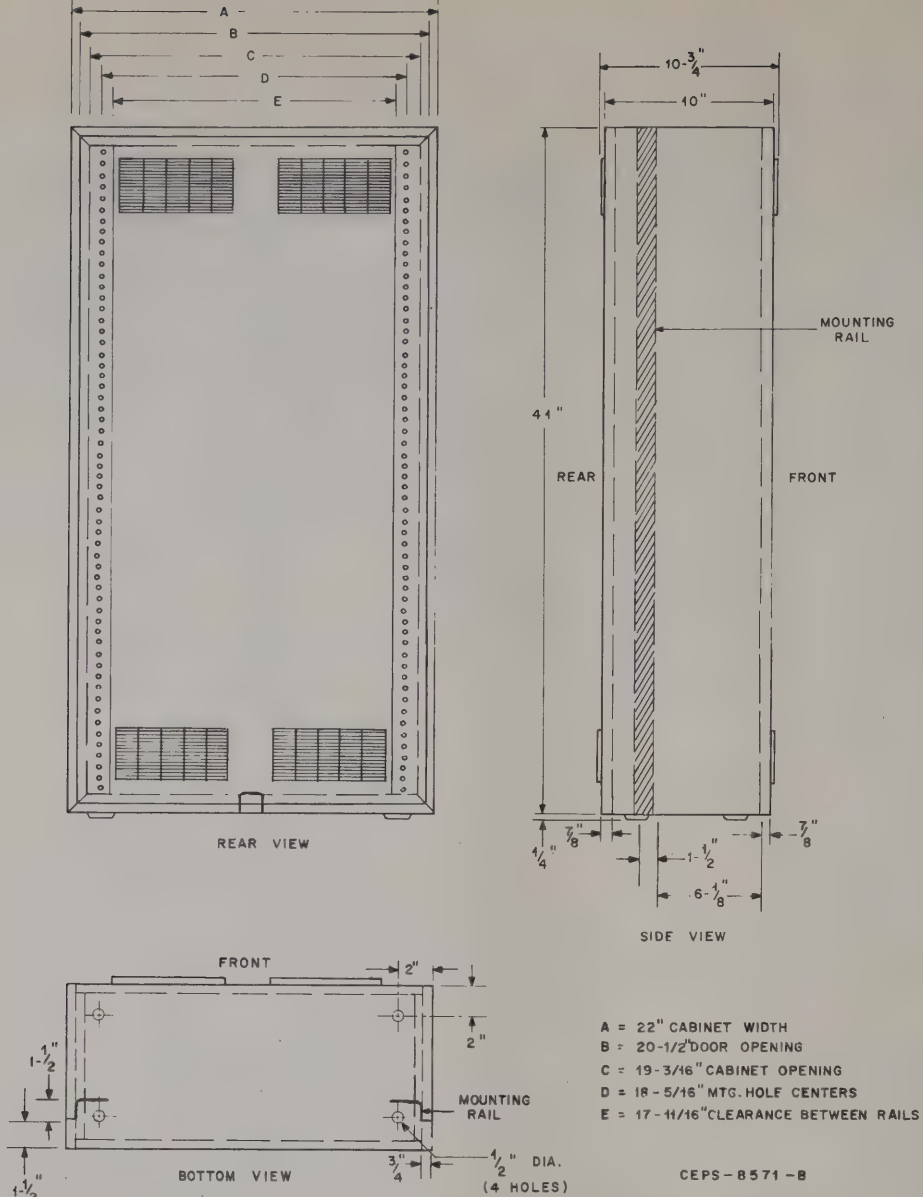
PARTS LIST

THN6141A Cabinet Kit (30 inch)

PL-1787-D

NON-REFERENCED ITEMS		
15E84107D25 13C84430D01 2S10101A55	CABINET (30") DOOR VENT (8 required) SPEED NUT (48 required)	

Intermittent Duty Stations
Cabinet Dimensional Detail & Parts List
Motorola No. PEPS-9221-A
6/20/80-PHI



TLN4861A Cabinet Hardware Kit
(continuous-duty repeater stations)

PL-1792-A

NON-REFERENCED ITEMS		
2D82360B07	SPEED NUT; 26 req'd.	
35135038	SCREW, tapping; 14 x 3/4"	
	Phillips pan head; 26 req'd.	
13B813618	DECAL; patents	
54A850440	LABEL; FCC license designation	
54A84857B01	LABEL; power output calibration	
54A83040C01	LABEL; exciter audio	
54A842366	LABEL; replacement parts	
33B83751C01	NAMEPLATE; model number	
15C84255D01	COVER; top; receiver	
15C84254D01	COVER; rear; receiver	
15C84253D01	COVER; front; receiver	
3S136890	SCREW, machine; 4-40 x 1/4"	
	Phillips hex head; 20 req'd.	
3A84141D01	SCREW; special type; 8 req'd.	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN4863A Cabinet Hardware Kit
(Continuous Duty Base Stations)

PL-1791-A

NON-REFERENCED ITEMS		
2D82360B07	SPEED NUT (26 req'd.)	
35135038	SCREW, tapping; No. 14 x 3/4"	
	Phillips pan head (26 req'd.)	
13B813618	DECAL (patents)	
54A850440	LABEL (FCC license designation)	
54A84857B01	LABEL (power output calibration)	
54A83040C01	LABEL (exciter audio)	
54A842366	LABEL (replacement parts)	
33B83751C01	NAMEPLATE (model number)	

THN6142A Cabinet Kit (41-Inch)

PL-1790-B

NON-REFERENCED ITEMS		
15E84143D24	CABINET (41")	
13C84430D01	DOOR VENT (8 required)	
2S10101A55	SPEED NUT (48 required)	

Continuous Duty Stations
Cabinet Dimensional Detail & Parts List
Motorola No. PEPS-9222-A
6/20/80-PHI

UPRIGHT OUTDOOR CABINET

OPTION U27 (FOR UPRIGHT STATIONS)
OPTION C36 (FOR “COMPA-STATION” BASE RADIOS)

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- Vent seal f
- Vent kit fo

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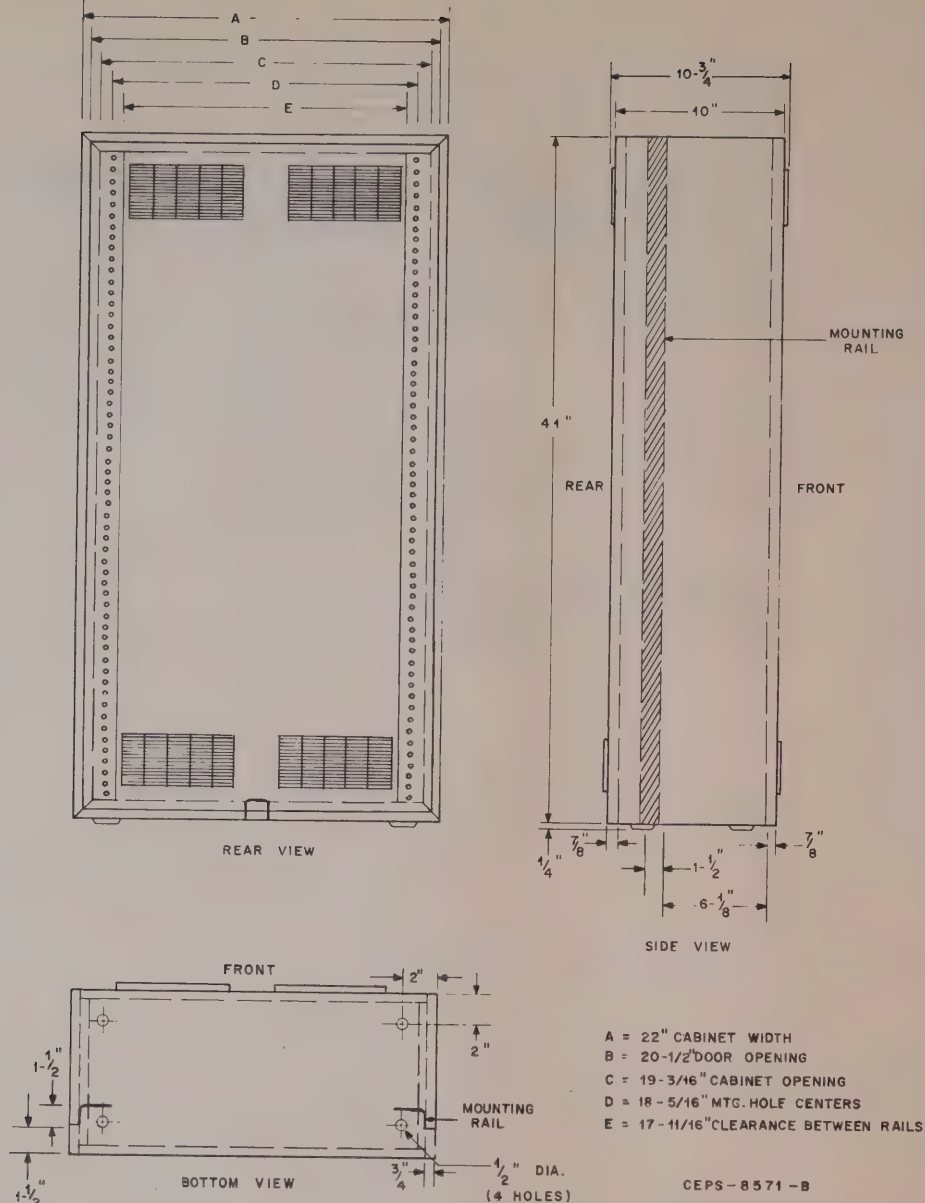
MODEL	SUFFIX	DESCRIPTION
THN6203A		75” Cabinet
TRN6720A		Rain Hood Vent Kit (for stations over 110 W only)
TRN6721A		Vent Seal Kit (for stations under 110 W only)

THE INDOOR CABINET FRONT AND REAR DOORS CAN BE CHANGED TO ALLOW LEFT-HAND OPENING INSTEAD OF RIGHT-HAND OPENING.
IF THE DOOR OPENING CHANGE MENTIONED IN NOTE 1 IS MADE, BE SURE TO RELOCATE THE VENT COVER TO THE UNUSED OPENING.
ELEVATE OUTDOOR CABINETS IF DANGER OF WATER SUBMERSION EXISTS.
DOORS ON OUTDOOR CABINET ARE NOT REMOVABLE.
STATIONS OVER 110 WATTS OUTPUT USE TRN6720A VENT KIT. STATIONS BELOW 110 WATT OUTPUT USE TRN6721A VENT SEAL KIT.

DESCRIPTION
PL-5107-O
ring, #8; 6 used machine; 8-32 x 3/8"; tapping; 8-18 x 3/8; tapping; 8-18 x 1/2; oor vent rain shield rain top cover top ; 13.0 x 4.5" ; 13.0 x 7.25" 6-hole; 2 used 4-hole; 2 used

68P81033E42-B
6/20/80-PHI

UPRIGHT OUTDOOR CABINET "COMPA-STATION" OUTDOOR CABINET



TLN4861A Cabinet Hardware Kit
(continuous-duty repeater stations)

PL-1792-A

NON-REFERENCED ITEMS		
2D82360B07	SPEED NUT; 26 req'd.	
3S135038	SCREW, tapping; 14 x 3/4"	
	Phillips pan head; 26 req'd.	
13B813618	DECAL; patents	
54A850440	LABEL; FCC license designation	
54A84857B01	LABEL; power output calibration	
54A83040C01	LABEL; exciter audio	
54A842366	LABEL; replacement parts	
33B83751C01	NAMEPLATE; model number	
15C84255D01	COVER; top; receiver	
15C84254D01	COVER; rear; receiver	
15C84253D01	COVER; front; receiver	
3S136890	SCREW, machine; 4-40 x 1/4"	
	Phillips hex head; 20 req'd.	
3A84141D01	SCREW; special type; 8 req'd.	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN4863A Cabinet Hardware Kit
(Continuous Duty Base Stations)

PL-1791-A

NON-REFERENCED ITEMS		
2D82360B07	SPEED NUT (26 req'd.)	
3S135038	SCREW, tapping; No. 14 x 3/4"	
	Phillips pan head (26 req'd.)	
13B813618	DECAL (patents)	
54A850440	LABEL (FCC license designation)	
54A84857B01	LABEL (power output calibration)	
54A83040C01	LABEL (exciter audio)	
54A842366	LABEL (replacement parts)	
33B83751C01	NAMEPLATE (model number)	

THN6142A Cabinet Kit (41-Inch)

PL-1790-B

NON-REFERENCED ITEMS		
15E84143D24	CABINET (41")	
13C84430D01	DOOR VENT (8 required)	
2S10101A55	SPEED NUT (48 required)	

Continuous Duty Stations
Cabinet Dimensional Detail & Parts List
Motorola No. PEPS-9222-A
6/20/80-PHI

UPRIGHT OUTDOOR CABINET

OPTION U27 (FOR UPRIGHT STATIONS)

OPTION C36 (FOR “COMPA-STATION” BASE RADIOS)

FEATURES

- ..Water drainage holes
- ..Thick door gaskets
- ..Vent seal for stations with less than 110 W output
- ..Vent kit for stations with greater than 110 W output

CABINET INSTALLATION

- ..Mount on elevated support or platform
- ..Shady or cool area if possible
- ..Minimum of eight inches for all obstructions

INSTALLATION OF TRN6720A RAIN HOOD VENT KIT

- ..Mount main section (largest assembly) over opening in top of cabinet using rectangular shaped gasket and 1/2-inch sheet metal screws provided.
- ..Install small rectangular cover inside main section using machine screws provided.
- ..Similarly, mount larger cover on top of entire assembly.
- ..Mount awning-shaped vent shield over rear door opening using “U” shaped gasket and 3/8-inch sheet metal screws. Place acorn nuts over screws to cover exposed threads.

PERIODIC MAINTENANCE

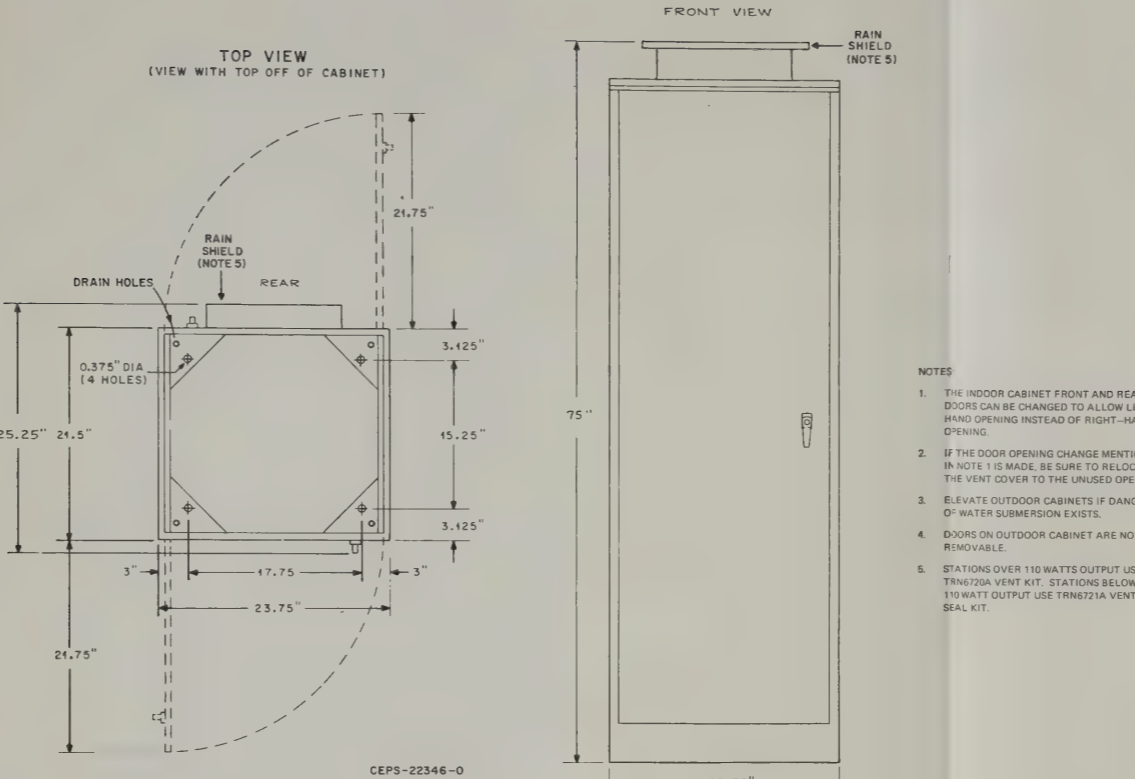
- ..Use a paint scraper or putty knife to remove all loose paint and paint blisters from the cabinet. Use a wire brush or steel wool to remove remaining rust from the area. The surface must be cleaned to bare metal and free of all rust.
- ..Wipe cleared surface with a clean cloth
- ..Apply a thin even coat of primer, Part No. 11S1003A42, to all exposed metal. This coat should dry to the touch in minutes. Apply an even smooth coat of paint, Part No. 11S10026A33 (haze beige).

NOTE

Be sure water drainage holes are cleared of all paint and primer.

--The above primer and paint are available from Communications Division Parts Department. Spray paint (Part No. 11-82716A05) and spray primer (Part No. ST-4330) are also available from Parts Department. However, spraying paint inside cabinet is not recommended.

-- The above kits and paint can be obtained from Motorola Communications Division Parts Department, 1313 East Algonquin Road, Schaumburg, Illinois 60196



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

THN6203A Cabinet (75-Inch)		PL-5198-O
	15-82123H05	CABINET, outdoor

TRN6721A Vent Seal Kit		PL-5106-O
	2-10080A03	NUT, spring; #8; 6 used
	3-132823	SCREW, tapping; #8-18 x 3/8"; 4 used
	3-135014	SCREW, tapping; #8-18 x 1/2; 6 used
	26-83956H01	SHIELD (2 hole)
	26-83956H03	SHIELD (1 hole)
	32-82499L01	GASKET; 13.0 x 4.5"
	32-82499L02	GASKET; 13.0 x 7.25"

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TRN6720A Rain Hood Vent Kit		PL-5107-O
	2-10080A03	NUT, spring; #8; 6 used
	3-9661	SCREW, machine; 8-32 x 3/8"; 8 used
	3-132823	SCREW, tapping; 8-18 x 3/8; 4 used
	3-135014	SCREW, tapping; 8-18 x 1/2; 8 used
	15-82433L01	HOOD, door vent
	15-82926H01	COVER, rain shield
	26-82929H01	SHIELD, rain top
	26-84084F01	SHIELD, cover top
	32-82499L01	GASKET; 13.0 x 4.5"
	32-82499L02	GASKET; 13.0 x 7.25"
	32-84180G01	GASKET; 6-hole; 2 used
	32-84180G02	GASKET; 4-hole; 2 used



MODEL	SUFFIX	DESCRIPTION
THN6203A		75" Cabinet
TRN6720A		Rain Hood Vent Kit (for stations over 110 W only)
TRN6721A		Vent Seal Kit (for stations under 110 W only)

ON

PL-3626-O

d.)

req'd.)

PL-5104-O

PL-5105-O

PL-1797-A

nt (No. 1);

nt (No. 2),

ver: 12 req'd

req'd

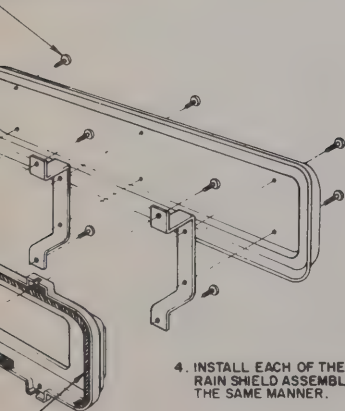
req'd

6-32 x 11/16"

-32 x 3/8"

1/4"; 24 req'd

H OUTER SHIELD
SACKETS.



4. INSTALL EACH OF THE FOUR
RAIN SHIELD ASSEMBLIES IN
THE SAME MANNER.

BACKING FROM GASKET AND PRESS
RESISVE SIDE INTO PLACE AS SHOWN.

1. LOCAL OPERATION FOR TESTING & MAINTENANCE

Once power is applied and the station is properly adjusted, this base or repeater station is normally operated entirely unattended from a remote control point. However, the station may be locally operated utilizing controls on the remote control chassis. This type of operation may be necessary to accomplish station maintenance and testing.

Local operation of the station is primarily accomplished utilizing controls on the station control module located in the remote control chassis. The controls and function are listed in the table on this page.

WARNING

The transmitter can be keyed remotely. To prevent unexpected transmitter keying while servicing the station, be sure the LINE DIS-

WARNING (Cont'd.)

ABLE switch is actuated (direction of arrow). Also, the TLN4662A Squelch Gate Module must be temporarily removed from the remote control chassis if the station is equipped with any of the following dc transfer modules:

TLN4637A (no suffix)
TLN4659A (no suffix)
TLN4664A (no suffix)

The following are procedures pertaining to the local operation of a remotely controlled station or repeater station.

a. Transmitter Control

To prevent the transmitter from being keyed remotely, set station control module LINE DISABLE switch in the direction of the arrow. At conclusion of local operation, insure that the LINE DISABLE switch is returned to its normal position (opposite direction of the arrow).

STATION CONTROL MODULE CONTROLS

CONTROL	POSITION	FUNCTIONS POSSIBLE
XMIT	Normal (not actuated)	Normal mode of operation.
	Actuated (hold to right)	Turns on transmitter with no modulation. Use test microphone connected to Local Mike receptacle to modulate transmitter.
"PL" DISABLE* (functional only in "Private-Line" stations)	Normal (left)	Only "PL" coded on-frequency signals accepted by receiver.
	Actuated (right)	All on-frequency signals accepted by receiver.
LINE DISABLE*	Normal (left)	Transmitter can be operated by: 1. XMIT switch 2. Local microphone 3. Remote control console
	Actuated (right)	Transmitter can <u>not</u> be operated by remote control console over control line.

*The DISABLE LIGHT is illuminated when the LINE DISABLE or "PL" DISABLE switch is actuated.



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Communications Division

Service publications
1301 E. Algonquin Road, Schaumburg, IL 60172

MAINTENANCE

“COMPA-STATION” OUTDOOR CABINET

OPTION C27 (FOR “COMPA-STATION” BASE RADIOS)

MODEL	SUFFIX	DESCRIPTION
THN6143A		46” Cabinet (vented for continuous duty)
THN6303A		46” Cabinet (sealed for intermittent duty only)
TLN4862A		Outdoor Vent Kit
TRN6448A		Cabinet Hardware Kit

FEATURES

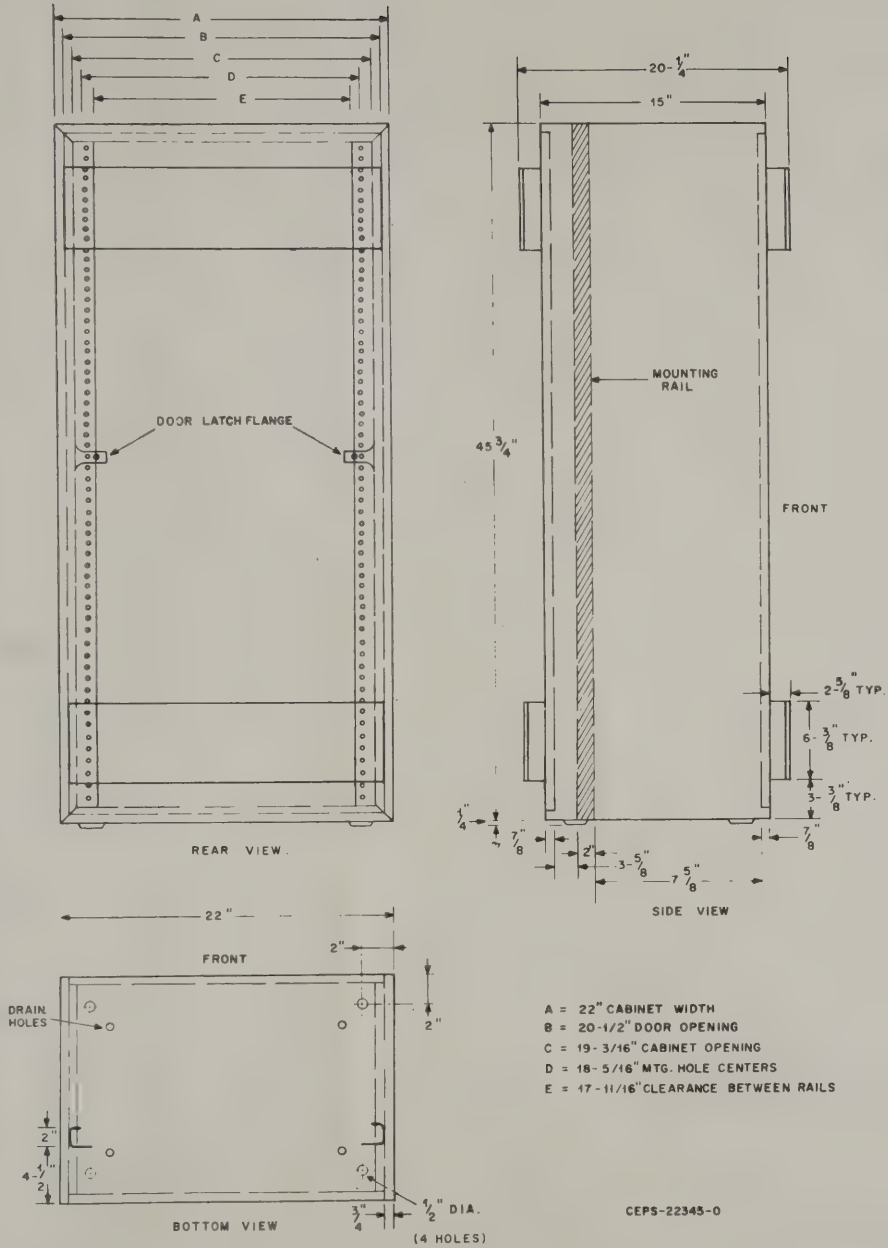
- Water drainage holes
- Rust resistant equipment mounting rails
- Thick door gaskets
- Screw and flange type door latches
- Vent seal for intermittent duty stations
- Vent kit for continuous duty stations
- Sealed cabinet corner joints

CABINET INSTALLATION

- Mount on elevated support or platform
- Shady or cool area if possible
- Minimum of eight inches for all obstructions

CAUTION
LOOSEN *BOTH* DOOR LATCHES BEFORE OPENING CABINET OR DAMAGE TO THE DOOR MAY RESULT.

68P81033E46-A
6/20/80-PHI



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

PARTS LIST

TRN6448A Cabinet Hardware Kit PL-3626-O

2-836540 3-135499	SPEED NUT (4 req'd.) SCREW, tapping; 1/4 - 14 x 5/8" (4 req'd.)
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THN6143A Vented 46-Inch Cabinet (For Continuous Duty Stations) PL-5104-O

15-84144D08	CABINET, outdoor
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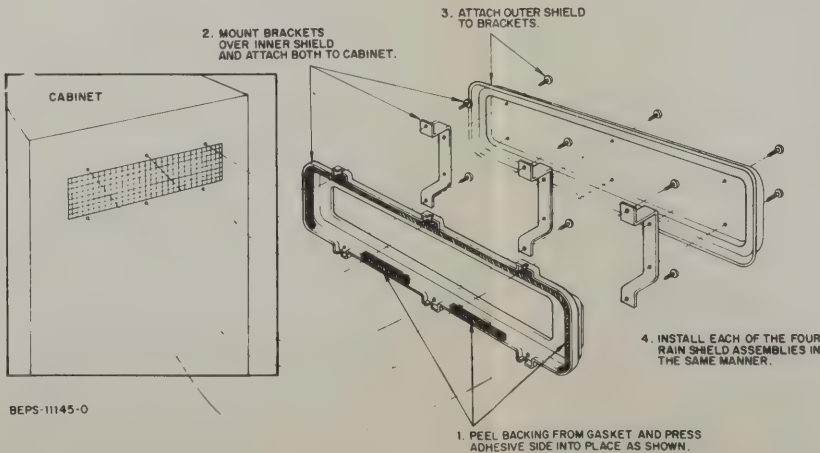
THN6303A Sealed 46-Inch Cabinet (For Intermittent Duty Station) PL-5105-O

15-84144D11	CABINET, outdoor
-------------	------------------

TLN4862A Outdoor Vent Kit PL-1797-A

15-84188D01	COVER, outdoor vent (No. 1); 4 req'd
15-84189D01	COVER, outdoor vent (No. 2), 4 req'd
32-84452D01	GASKET: 4 req'd
32-84452D02	GASKET: 8 req'd
7-84187D01	BRACKET, vent cover: 12 req'd
4-490775	FLATWASHER: 24 req'd
4-9795	LOCKWASHER: 24 req'd
3-138674	SCREW, machine: 6-32 x 11/16" 24 req'd
3-138209	SCREW, tapping: 6-32 x 3/8" 24 req'd
2-7005	NUT, hex: 6-32 x 1/4"; 24 req'd

Outdoor Vent Kit



1. LOCAL OPERATION FOR TESTING & MAINTENANCE

Once power is applied and the station is properly adjusted, this base or repeater station is normally operated entirely unattended from a remote control point. However, the station may be locally operated utilizing controls on the remote control chassis. This type of operation may be necessary to accomplish station maintenance and testing.

Local operation of the station is primarily accomplished utilizing controls on the station control module located in the remote control chassis. The controls and function are listed in the table on this page.

WARNING

The transmitter can be keyed remotely. To prevent unexpected transmitter keying while servicing the station, be sure the LINE DIS-

WARNING (Cont'd.)

ABLE switch is actuated (direction of arrow). Also, the TLN4662A Squelch Gate Module must be temporarily removed from the remote control chassis if the station is equipped with any of the following dc transfer modules:

- TLN4637A (no suffix)
- TLN4659A (no suffix)
- TLN4664A (no suffix)

The following are procedures pertaining to the local operation of a remotely controlled station or repeater station.

a. Transmitter Control

To prevent the transmitter from being keyed remotely, set station control module LINE DISABLE switch in the direction of the arrow. At conclusion of local operation, insure that the LINE DISABLE switch is returned to its normal position (opposite direction of the arrow).

STATION CONTROL MODULE CONTROLS

CONTROL	POSITION	FUNCTIONS POSSIBLE
XMIT	Normal (not actuated)	Normal mode of operation.
	Actuated (hold to right)	Turns on transmitter with no modulation. Use test microphone connected to Local Mike receptacle to modulate transmitter.
"PL" DISABLE* (functional only in "Private-Line" stations)	Normal (left)	Only "PL" coded on-frequency signals accepted by receiver.
	Actuated (right)	All on-frequency signals accepted by receiver.
LINE DISABLE*	Normal (left)	Transmitter can be operated by: 1. XMIT switch 2. Local microphone 3. Remote control console
	Actuated (right)	Transmitter can <u>not</u> be operated by remote control console over control line.

*The DISABLE LIGHT is illuminated when the LINE DISABLE or "PL" DISABLE switch is actuated.

b. Local Microphone

Connect a "Micor" microphone (Motorola Model TMN6054A or equivalent) to the microphone receptacle on the remote control chassis (part of J4, pins 3, 4, 5, 14, 15 & 16).

c. Local Speaker

Set the LOCAL SPKR switch to the ON position, for stations equipped with a local speaker, or connect any 8-ohm, 10-watt test speaker to J4, pins 1 and 12, on the remote control chassis. This speaker is used to monitor all received messages. A Motorola "Micor" speaker (Models TSN6016A or B, TSN6020A) plugs directly into these pins without requiring any adapter.

d. Portable Test Set

A Motorola S1056B-S1059B Series Portable Test Set with TEK-37 or TEK-37A Adapter Cable can be used as a local control facility. Connect the red "control" plug of the adapter cable to the metering receptacle (J3) on the remote control chassis. The speaker in the test set can be used for monitoring received signals and a "Motrac" microphone (Model TMN6071A) connected to the microphone receptacle on the test set can be used for originating transmissions. The XMIT button on the test set can be used to key the transmitter without voice modulation.

e. Frequency Selection

On stations with two-frequency transmitter, the frequency can be locally selected by the F1-F2 switch on the dc transfer module or F2 tone decoder module. On stations with two-frequency receivers, frequency selection is made by momentarily operating the REC F1 SELECT or REC F2 SELECT switch on the dc transfer module or F2 tone decoder module.

f. Selection of Other Modes

All other functions that can be activated by remote control can also be activated locally. Each module has test switches to activate any such functions, such as RPTR ON and RPTR OFF. Most of these switches are momentary action, which allows the station to continue operating in the selected mode until reset.

g. Received Audio

After the local speaker is turned on or connected, the station is ready to receive audio. The receiver "PL" feature, if used, can be defeated by setting the station control module "PL" DISABLE switch in the direction of the arrow. (At the conclusion of local operation, insure that

the "PL" DISABLE switch is returned to its normal position.) If necessary, the receiver can be unscelched utilizing the receiver SQUELCH control on the receiver chassis. The VOLUME control on the receiver chassis sets the audio output level of the local speaker.

h. Transmitting

NOTE

Before initiating any local transmissions, monitor the channel to insure that it is clear of other transmissions.

The transmitter is keyed locally by either activating the station control module XMIT switch or activating the push-to-talk microphone switch. Voice is transmitted using the local microphone.

i. Concluding Local Operation

At the conclusion of local operation, perform the following operations and checks to insure that the station is ready for remote operation.

(1) Reset receiver squelch level per procedures in Receiver RF and IF Section of this manual.

(2) Insure that station control module switches are positioned for normal operation (reference table).

(3) Disconnect microphone and test speaker (if used).

(4) Set all external power switches ON.

(5) Insure that station is operable from remote location.

(6) Turn local speaker OFF (if applicable).

(7) Insure that cabinet doors are locked.

(8) Insure that vents in cabinet are unobstructed.

2. MAINTENANCE TECHNIQUES

NOTE

Male connectors that mate with 50-pin flat cable connectors have been sprayed with a special compound. This compound is greasy to the touch and must not be wiped off the connector. The compound improves electrical continuity and prevents contact resistance problems.

3. TROUBLESHOOTING

Maintenance procedures for individual chassis and modules which comprise this station are contained in the applicable section of this manual. As an aid to isolating a malfunction to a specific chassis or module, a variety of techniques are appropriate.

--Most troubles in the transmitter or receiver can be quickly isolated with a Motorola portable test set, or built-in station metering if the station is so equipped. A log of normal meter readings for this station should be maintained. Each time maintenance is performed, the meter readings should be entered into the log. Variations from the previous readings can isolate a malfunction or may indicate an impending failure. If no previous meter readings are available, typical or minimum meter readings may be found in the receiver rf & i-f, exciter, power amplifier or power control board sections of this manual, as well as metering procedures.

--A check of power supply voltage under load and no-load conditions (transmit and standby) should quickly isolate any malfunction to that chassis. A comprehensive troubleshooting procedure for that chassis is provided in the power supply section of this manual.

--Isolation of a malfunction in the remote control unit requires a functional understanding of overall station operation and the interrelationship between the various modules and chassis of the station. The "Functional Description" portion of the DESCRIPTION section of this manual, along with the STATION DIAGRAM at the end of the manual, should provide this information. With a basic understanding of station operation, troubles may be isolated by analyzing the following questions:

Can the station be operated locally but not remotely? If so, this eliminates many circuits as possible sources of trouble.

How many modes are inoperable? Concentrate testing on circuits that are common to the inoperable modes.

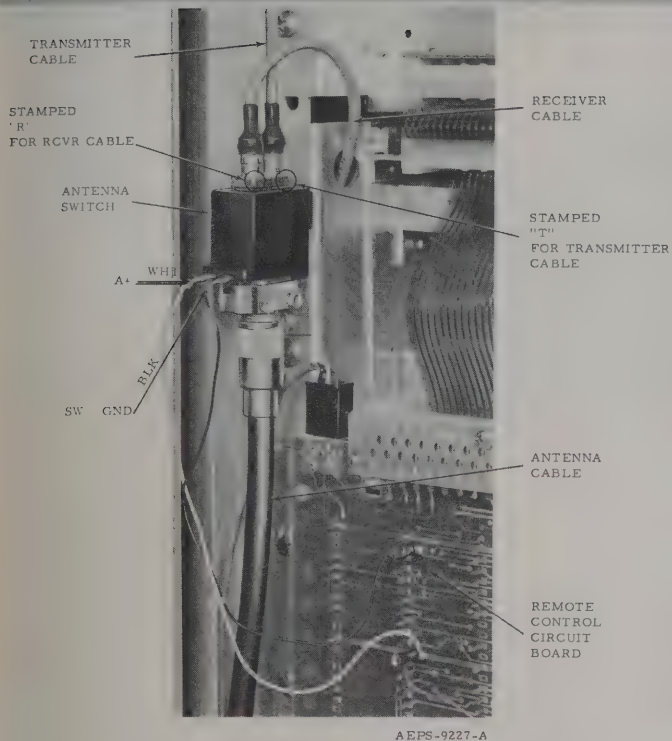
Are adjustments properly set? This includes audio level adjustments at the station and at the remote control console.

Are jumpers properly installed? The many jumpers in this equipment provides vast flexibility, but could be a source of trouble if improperly added or removed.

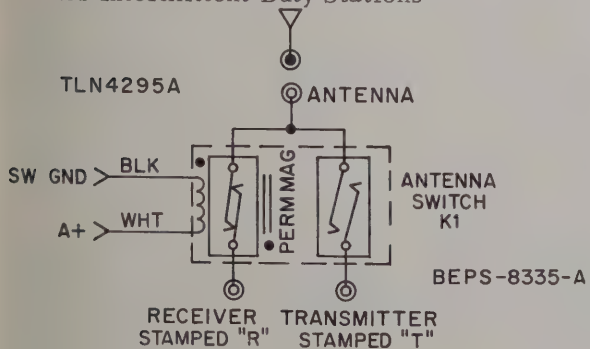
ANTENNA SWITCH

MODEL TLN4295A

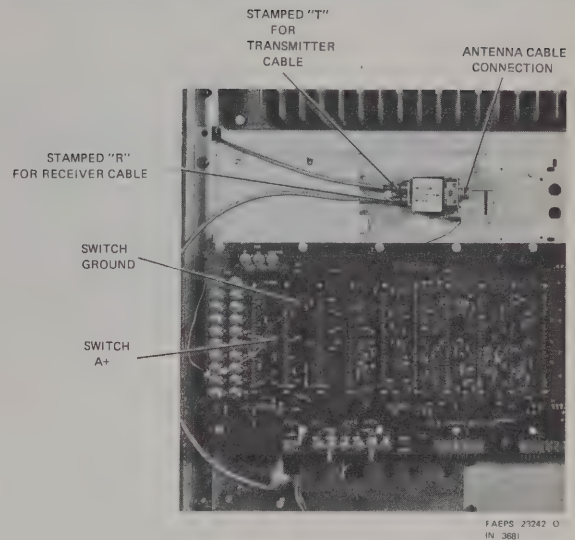
& MISCELLANEOUS HARDWARE



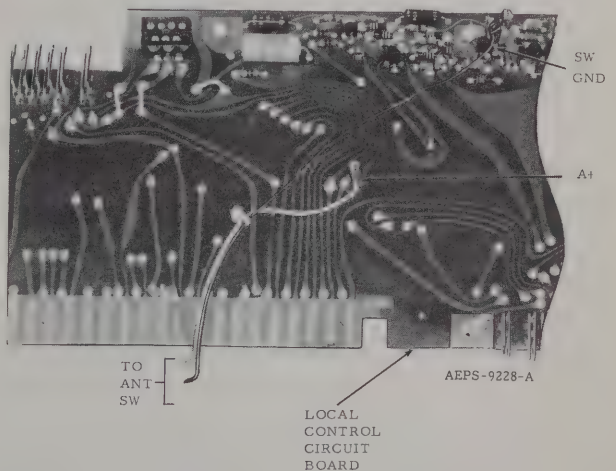
Antenna Switch Installation and Connection for Intermittent Duty Stations



Antenna Switch Schematic Diagram



Antenna Switch Installation and Connection for Continuous Duty Stations



Antenna Switch Connection to Local Control Circuit Board

PARTS LIST SHOWN ON
BACK OF THIS PAGE.

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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA
PART NUMBERS WHEN ORDERING
REPLACEMENT PARTS

Antenna Switch

PL-1731-O

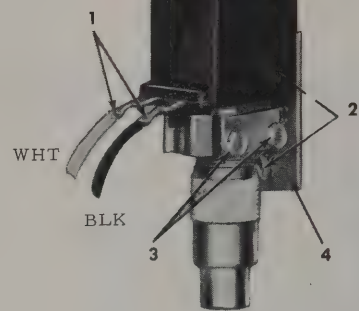
K1	TLN4295A	<u>REED SWITCH:</u> antenna switch <u>NOTE</u> Field servicing of this item not recommended, must be replaced as a unit.
----	----------	---

Mechanical Items (not part of antenna switch)

1	29-82010D01	TERMINAL, female
2	3-131965	LOCKSCREW: tapping, 8-32 x 3/8" pln hex
3	3-135841	LOCKSCREW: tapping, 6-32 x 1" pln hex
4	7-84266D01	BRACKET

STAMPED
"R"
FOR RCVR. CABLE

STAMPED
"T"
FOR TRANSMITTER
CABLE



FAEPS-8641-A

FILTERS AND DUPLEXERS

T1480A SERIES
148-174 MHz



FAEPS-8408-O

1. INTRODUCTION

These filters and duplexers are for use with "Motorola" FM two-way radio communications equipment operating in the 148-174 MHz frequency range. They utilize cavity resonators with a special internal loading construction to achieve a size much less than one-quarter wavelength and are tuned with an adjustable center conductor. The resonators use a unique temperature compensating mechanism and uniquely adjustable coupling loops. Specially designed low-profile cable connectors are used to obtain an extremely compact package.

These units may be used in the antenna circuit of a base station or repeater to eliminate or minimize receiver desensitization or intermodulation from strong signals. Similarly, they may be used to reduce transmitter noise or intermodulation products.

2. INSTALLATION

a. Bracket-Mounted Filters

(1) Carefully unpack the unit and check for concealed damage.

(2) Select a mounting location near the associated equipment or inside the equipment cabinet that will permit using the shortest cabling between the filter and the equipment.

(3) Using the mounting bracket as a template, mark the locations of the desired mounting holes.

(4) Drill the mounting holes required by the type of mounting hardware to be used.

(5) Mount the filter using the hardware supplied.

(6) Connect the filter to the transmitter or receiver. Cables external to the filter are not of a critical length.



MOTOROLA INC.
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service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

PERFORMANCE SPECIFICATIONS

FILTERS

MODEL NUMBER	T1481A	T1482A
INSERTION LOSS	0.6 dB	1.3 dB
MAXIMUM POWER INPUT	125 W	125 W
MINIMUM PASS-REJECT SEPARATION	1.5 MHz	±1.5 MHz
MINIMUM REJECT ATTENUATION	35 dB @ 1.5 MHz	42 dB @ 1.5 MHz
TEMPERATURE RANGE	-30°C to +60°C	-30°C to +60°C
SIZE	6" x 5" x 8-1/2"	19" x 5-1/2" x 8-1/2"
TERMINATION	N Female	N Female

DUPLEXERS

MODEL NUMBER	T1485A	T1485AF	T1487A	T1487AF
INSERTION LOSS	0.7 dB	0.9 dB	1.5 dB	1.7 dB
ISOLATION AT TRANSMIT FREQUENCY	52 dB		82 dB	
ISOLATION AT RECEIVER FREQUENCY	52 dB		82 dB	
MINIMUM TRANSMITTER RECEIVER ISOLATION	35 dB		52 dB	
MINIMUM FREQUENCY SEPARATION	3 MHz		1.5 MHz	
VSWR MAXIMUM	1.5:1		1.5:1	
MAXIMUM POWER INPUT	125 W		125 W	
TEMPERATURE RANGE	-30°C to +60°C		-30°C to +60°C	
SIZE	19" x 5-1/2" x 8-1/2"		19" x 5-1/2" x 8-1/2"	
TERMINATION	N Female		N Female	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

EPS-8409-O

MOTOROLA

MODEL CHART

FOR

FILTERS AND DUPLEXERS

148-174 MHz

CODE:

X = ONE ITEM SUPPLIED.

2 = NUMBER INDICATES QUANTITY OF ITEMS SUPPLIED.

[illegible]

EPS-8410-O

b. Rack Panel-Mounted Units

(1) Carefully unpack the unit and check for concealed damage.

(2) The units are designed to mount on any standard 19-inch relay rack. Select position in rack for best location of unit, i.e., closest proximity to associated equipment inputs and outputs.

(3) Mount unit in place in rack with appropriate mounting hardware. The hardware supplied is intended for use with "Motorola" base stations.

(4) Connect the filter or duplexer to the transmitter and receiver.

(5) Duplexers and filters must be installed with appropriate lengths of 50-ohm coaxial cable (not supplied) to fit the individual installation.

3. THEORY OF OPERATION

Each resonant cavity, technically a re-entrant quarter-wave resonator, is a very high Q (low loss) tunable tank circuit. A special internal construction uses two different characteristic impedances for the center conductor to achieve an overall length considerably less than a quarter-wavelength. The dimensions are designed for minimum loss. The cavities are tuned to the required pass frequency by an adjustment which changes the length of the center conductor. Lower frequencies have more of the center conductor inside the cavity, higher frequencies have correspondingly less. Special bimetal washers are used for temperature compensation to minimize detuning due to ambient temperature changes.

Each resonant cavity is fitted with a specially designed pair of coupling elements (loops). These loops efficiently convert energy from the 50-ohm coaxial cable to the correct mode inside the resonant structure. When the cavity is not tuned to resonance, most of the energy is reflected. Only a small portion is able to excite the correct mode and reach the output element.

The input and output coupling loops are placed very close to each other, to take advantage of mutual coupling. A small amount of energy is always being transferred between coupling loops because of their proximity. At one frequency, the energy transferred by mutual coupling cancels the energy transferred across by the resonant

mode within the cavity. Thus, at one frequency, there is a reject notch in addition to the normal selectivity of the cavity. The proximity of the loops provides inductive coupling. In addition, a precision high Q trimmer capacitor is connected across the loops. This capacitor can adjust the net coupling to be inductive or capacitive. When the net coupling is inductive, the notch occurs above the pass frequency. When the net coupling is capacitive, the notch occurs below the pass frequency.

Cavities are used on each side of a duplexer. The cavities tuned to pass the lower frequency have the coupling loops tuned to notch out the higher frequency, while the cavities tuned to pass the higher frequency have the coupling loops tuned to notch out the lower frequency. Quarter-wave coupling is used between cavities to obtain minimum pass band bandwidth and minimum insertion loss.

4. REMOVAL/REPLACEMENT OF COUPLING LOOPS

Coupling loops are factory-installed in all T1480A Series Cavity Filters and Duplexers. If it becomes necessary to change coupling loops, refer to Figures 1, 2 and 3 and use the following procedure.

a. Removal Procedure

The cable shields are soldered to the connector portion of the loops. These shields must first be unsoldered before the loops can be removed. The shields cannot be unsoldered while the connectors are attached to the cavity body because the cavity body acts as a heat sink.

(1) Remove the eight screws securing the connectors to the cavity body.

(2) The two coupling loops are internally connected and must be removed together. Using a 150-watt soldering iron, first unsolder and remove the connector covers from the two connectors.

(3) Grasp the center conductor of the cable (at the point where it enters the center pin of the connector) with long nose pliers. Melt the solder around the cable shield and pull the cable off the connector. Do the same for the other connector.

(4) Remove the two knurled adjusting knobs taking care not to lose the washers. Now the loops are completely free and can be removed from the can.

PARTS LIST

TLD8392A Cavity Filter

PL-1677-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3-3375	SCREW, tapping: 6-20 x 5/16" plain hex head (4 req'd)
2	1-84312D01	CAVITY ASSEMBLY
3	1-80723B90	LOOP ASSEMBLY, coupling
4	47-84313D01	TUNING SHAFT
5	3-134168	SCREW, tapping: 4-32 x 1/4" Phillips hex head; internal lockwasher (8 req'd)
7	3-82245E04	SCREW, knurled head (2 req'd)
7	4-9746	LOCKWASHER: No. 8 med. split (2 req'd)
7	4-82418B01	WASHER, nylon (2 req'd)
9	15-84993C02	COVER, housing
10	4-84994C01	WASHER, temperature compensating ("LE" stamped on concave side)
11	4-84994C02	WASHER, temperature compensating ("LE" stamped on convex side)
12	1-84985C01	LOCKING NUT ASSEMBLY
13	3-7110	SCREW, set: 8-32 x 3/16" allen head
14	1-84314D01	TUNING CAN ASSEMBLY
15	42-824977	RING, truarc

TLN4565A Mounting Hardware Kit (1-Cavity)

PL-1678-O

CODE	MOTOROLA PART NO.	DESCRIPTION
8	7-84395D01	BRACKET, cavity mtg
	3-3398	SCREW, tapping: 6-20 x 3/8" plain hex head (4 req'd)
	3-1209	SCREW, machine: 10-32 x 1/2" slotted binder head (4 req'd)
	3-7658	LOCKWASHER: No. 10 internal (4 req'd)
	2-7048	NUT, machine: 10-32 x 5/16" hex (4 req'd)
	3-136716	SCREW, wood: No. 10 x 1-1/2" slotted round head (4 req'd)
	33-84002B01	NAMEPLATE, cavity
	66-82846D01	TOOL, tuning

TLN4566A Mounting Hardware Kit (2 or 4-Cavities) PL-1679-O

CODE	MOTOROLA PART NO.	DESCRIPTION
8	64-84003D01	PANEL, cavity mtg (top)
	64-84004D01	PANEL, cavity mtg (bottom)
	3-3398	SCREW, tapping: 6-20 x 3/8" plain hex head (16 req'd)
	3-128109	SCREW: 6-32 x 1/4" slotted round head; external lockwasher (6 req'd)
	3-135038	SCREW, tapping: No. 14 x 3/4" Phillips pan head (4 req'd)
	2-82360B07	NUT, sheet spring: ("clip-on"); type "U" (4 req'd)
	4-812732	WASHER, cushion (4 req'd)
	33-84333B01	NAMEPLATE
	66-82846D01	TOOL, tuning



FAEPS-8411-O

Figure
Cavity Filter
Location Detail

NOTE:

THE OVERALL DIMENSIONS AND TUNING CABLES ARE CRITICAL, AND IT IS RECOMMENDED THAT AN ENTIRE CAVITY FILTER BE ORDERED USING THE CORRECT TKN NUMBER (TKN6473A OR TKN6474A). THE COIL PART NO. (CODE NO. 6) ARE INCLUDED IN THE PARTS LIST.

Cavity Filter

Parts Location Detail and Parts List

Motorola No. PEPS-8095-O

6/20/80-PHI

b. Rack Panel-Mounted Units

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(3) Mount unit in place in rack with appropriate mounting hardware. The hardware supplied is intended for use with "Motorola" base stations.

(4) Connect the filter or duplexer to the transmitter and receiver.

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3. THEORY OF OPERATION

Each resonant cavity, technically a re-entrant quarter-wave resonator, is a very high Q (low loss) tunable tank circuit. A special internal construction uses two different characteristic impedances for the center conductor to achieve an overall length considerably less than a quarter-wavelength. The dimensions are designed for minimum loss. The cavities are tuned to the required pass frequency by an adjustment which changes the length of the center conductor. Lower frequencies have more of the center conductor inside the cavity, higher frequencies have correspondingly less. Special bimetal washers are used for temperature compensation to minimize detuning due to ambient temperature changes.

Each resonant cavity is fitted with a specially designed pair of coupling elements (loops). These loops efficiently convert energy from the 50-ohm coaxial cable to the correct mode inside the resonant structure. When the cavity is not tuned to resonance, most of the energy is reflected. Only a small portion is able to excite the correct mode and reach the output element.

The input and output coupling loops are placed very close to each other, to take advantage of mutual coupling. A small amount of energy is always being transferred between coupling loops because of their proximity. At one frequency, the energy transferred by mutual coupling cancels the energy transferred across by the resonant

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The cable shields are soldered to the connector portion of the loops. These shields must first be unsoldered before the loops can be removed. The shields cannot be unsoldered while the connectors are attached to the cavity body because the cavity body acts as a heat sink.

(1) Remove the eight screws securing the connectors to the cavity body.

(2) The two coupling loops are internally connected and must be removed together. Using a 150-watt soldering iron, first unsolder and remove the connector covers from the two connectors.

(3) Grasp the center conductor of the cable (at the point where it enters the center pin of the connector) with long nose pliers. Melt the solder around the cable shield and pull the cable off the connector. Do the same for the other connector.

(4) Remove the two knurled adjusting knobs taking care not to lose the washers. Now the loops are completely free and can be removed from the can.

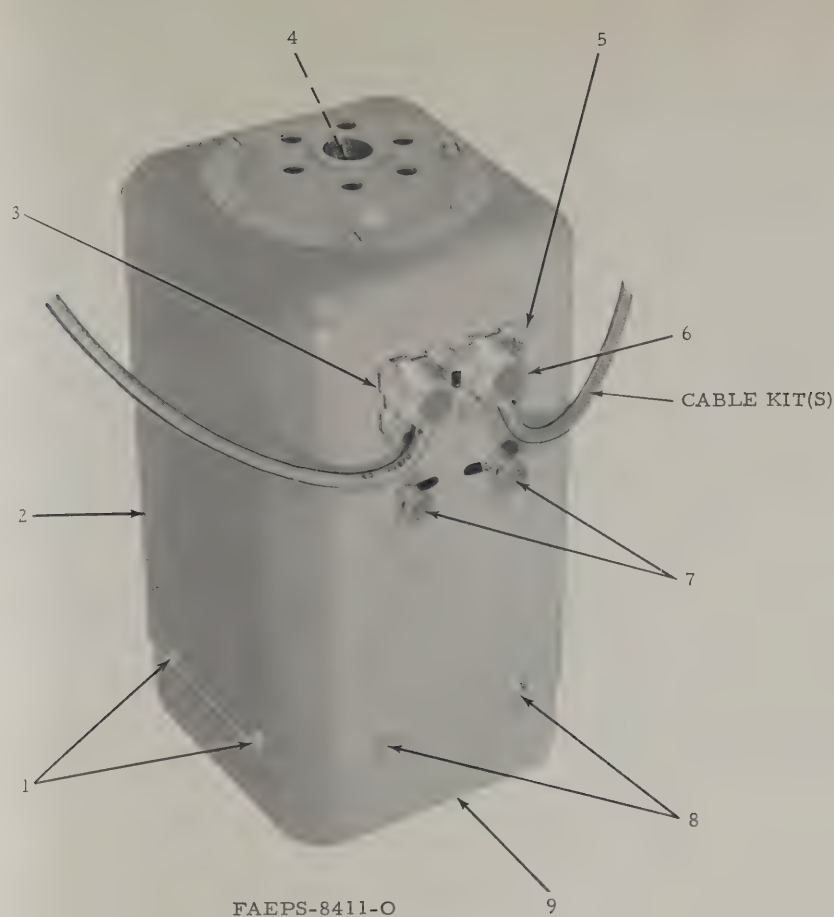


Figure 1.
Cavity Filter Parts
Location Detail

NOTE:

THE OVERALL DIMENSIONS AND THE STRIPPING OF CABLES ARE CRITICAL, AND IT IS THEREFORE RECOMMENDED THAT AN ENTIRE CABLE KIT BE ORDERED USING THE CORRECT TKN NUMBER (TKN6471A, TKN6472A, TKN6473A OR TKN6474A). THE CONNECTOR COVERS (CODE NO. 6) ARE INCLUDED IN THE CABLE KIT.

EPS-8086-O

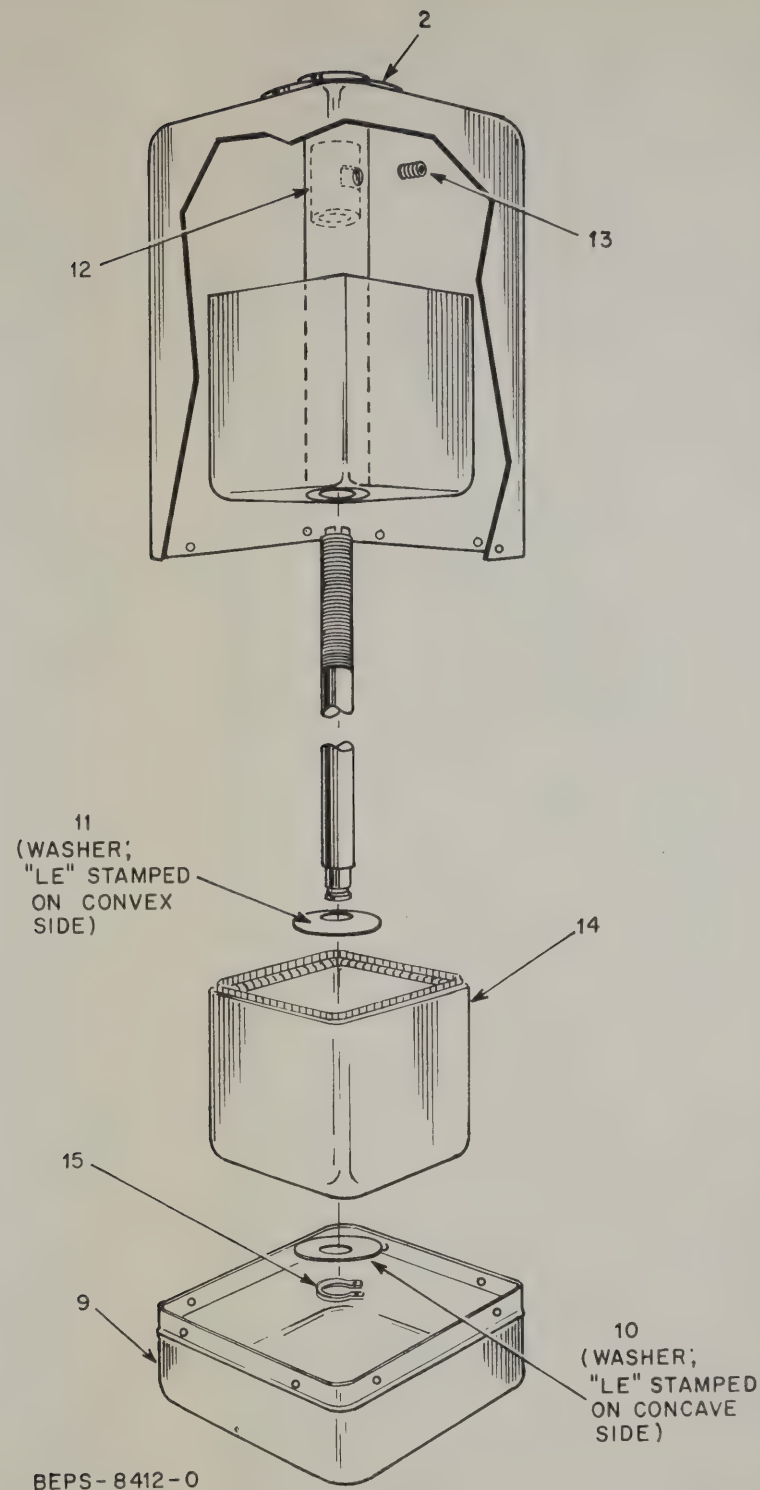


Figure 2.
Cavity Internal Construction
and Parts Location Detail

PARTS LIST

TLD8392A Cavity Filter

PL-1677-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3-3375	SCREW, tapping: 6-20 x 5/16" plain hex head (4 req'd)
2	1-84312D01	CAVITY ASSEMBLY
3	1-80723B90	LOOP ASSEMBLY, coupling
4	47-84313D01	TUNING SHAFT
5	3-134168	SCREW, tapping: 4-32 x 1/4" Phillips hex head; internal lockwasher (8 req'd)
7	3-82245E04	SCREW, knurled head (2 req'd)
7	4-9746	LOCKWASHER: No. 8 med. split (2 req'd)
7	4-82418B01	WASHER, nylon (2 req'd)
9	15-84993C02	COVER, housing
10	4-84994C01	WASHER, temperature compensating ("LE" stamped on concave side)
11	4-84994C02	WASHER, temperature compensating ("LE" stamped on convex side)
12	1-84985C01	LOCKING NUT ASSEMBLY
13	3-7110	SCREW, set: 8-32 x 3/16" allen head
14	1-84314D01	TUNING CAN ASSEMBLY
15	42-824977	RING, truarc

TLN4565A Mounting Hardware Kit (1-Cavity)

PL-1678-O

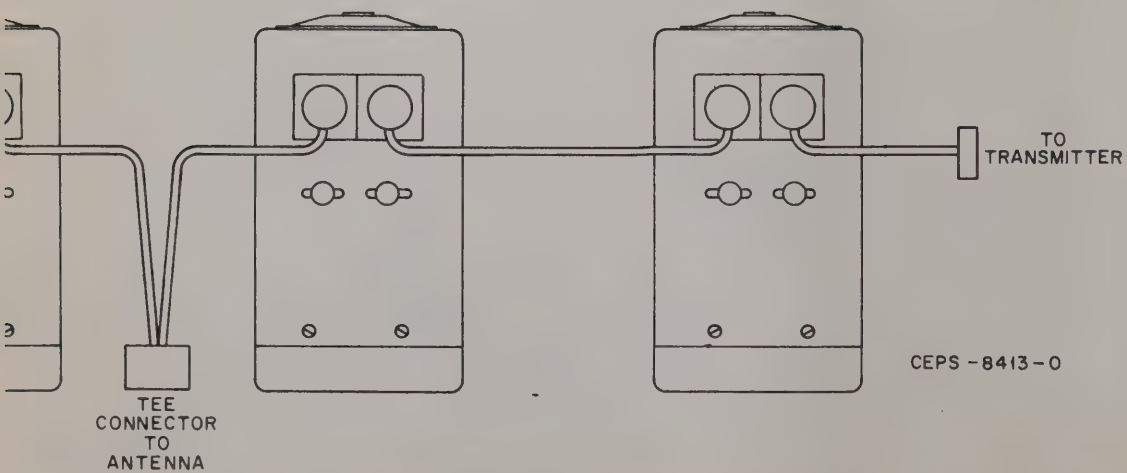
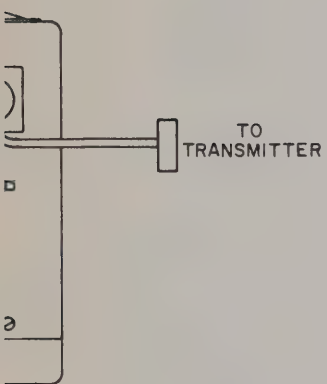
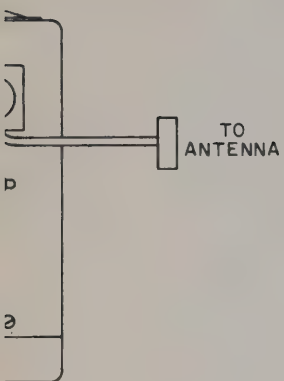
CODE	MOTOROLA PART NO.	DESCRIPTION
8	7-84395D01	BRACKET, cavity mtg
	3-3398	SCREW, tapping: 6-20 x 3/8" plain hex head (4 req'd)
	3-1209	SCREW, machine: 10-32 x 1/2" slotted binder head (4 req'd)
	3-7658	LOCKWASHER: No. 10 internal (4 req'd)
	2-7048	NUT, machine: 10-32 x 5/16" hex (4 req'd)
	3-136716	SCREW, wood: No. 10 x 1-1/2" slotted round head (4 req'd)
	33-84002B01	NAMEPLATE, cavity
	66-82846D01	TOOL, tuning

TLN4566A Mounting Hardware Kit (2 or 4-Cavities)

PL-1679-O

CODE	MOTOROLA PART NO.	DESCRIPTION
8	64-84003D01	PANEL, cavity mtg (top)
	64-84004D01	PANEL, cavity mtg (bottom)
	3-3398	SCREW, tapping: 6-20 x 3/8" plain hex head (16 req'd)
	3-128109	SCREW: 6-32 x 1/4" slotted round head; external lockwasher (6 req'd)
	3-135038	SCREW, tapping: No. 14 x 3/4" Phillips pan head (4 req'd)
	2-82360B07	NUT, sheet spring: ("clip-on") type "U" (4 req'd)
	4-812732	WASHER, cushion (4 req'd)
	33-84333B01	NAMEPLATE
	66-82846D01	TOOL, tuning

Cavity Filter
Parts Location Detail and Parts List
Motorola No. PEPS-8095-O
6/20/80-PHI



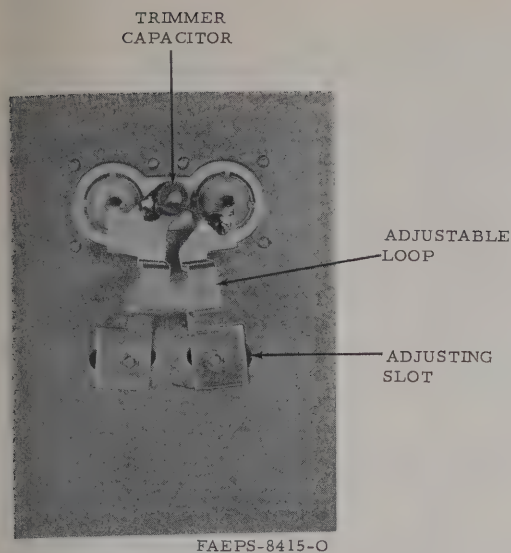


Figure 3.
Coupling Loop (Interior View)

(5) Maneuver both loops to the left so that the trimmer capacitor can fit through the left side of the hole and then remove the two loops together.

b. Replacement Procedure

(1) Insert the loop assembly into the mounting holes and maneuver both loops to the left so that the trimmer capacitor will fit through the left side of the hole.

(2) Position the loops so that the tapped holes in the end of the loops are visible through the adjusting slots.

(3) Insert the knurled adjusting screw, along with the nylon and lock washers, into the tapped hole.

(4) Attach the connectors to the can using the eight self-tapping screws making certain that the connector cable slot is facing in the proper direction to insert the cable.

(5) Insert the cable into the connector cable slot while pressing the center conductor into the center pin of the connector.

(6) Place the connector cover over the connector and solder the cable shield and connector cover to the connector.

5. RECOMMENDED TUNING PROCEDURE

All filters and duplexers are tuned to the customer-specified frequencies prior to shipment

from the factor. If system performance indicates that the duplexer is detuned, one of the following procedures may be used. Do not attempt to retune unless the following procedures have been read and it is certain that performance does not meet specifications.

The following tuning procedures assume that the entire duplexer is to be retuned. If it is desired to perform a minor "touch-up", refer to paragraph e. of this tuning procedure. When left and right are used in the following procedures, this shall mean facing the tuning shaft end and with the connectors facing up.

a. Method 1 (Models T1485A, AF and T1487A, AF)

(1) Recommended Test Equipment

(a) "Motorola Model R1201 Series Signal Generator.

(b) Tunable receiver or two "Motorola" receivers, one tuned to each of the frequencies to be duplexed.

(2) Tuning Procedure

(a) Move sliding screws as far apart as possible on each cavity and then tighten the screws.

(b) Turn trimmer capacitors fully counterclockwise.

(c) Tune the signal generator and the receiver to the duplex receive frequency.

(d) Connect the signal generator to the antenna port and the receiver to the right-hand port.

(e) Tune the right-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(f) Tune the signal generator and the receiver to the duplex transmit frequency.

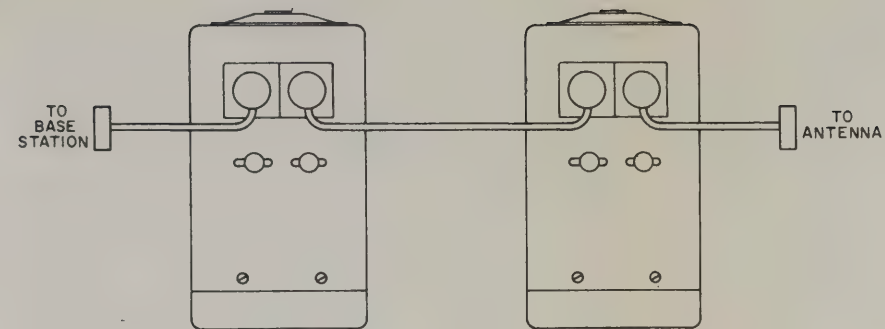
(g) Connect the receiver to the left-hand port.

(h) Tune the left-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

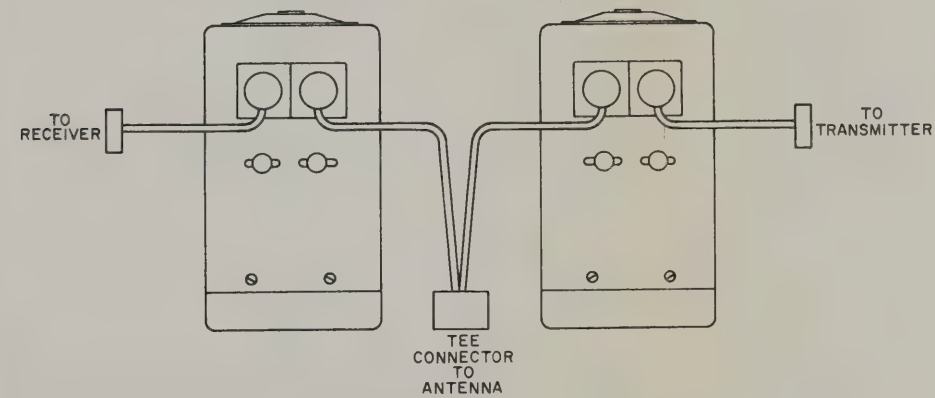
(i) Connect the receiver to the right-hand port.

(j) Tune the right-hand cavity(s) for maximum attenuation by using procedure 5.f., "Tuning the Notch".

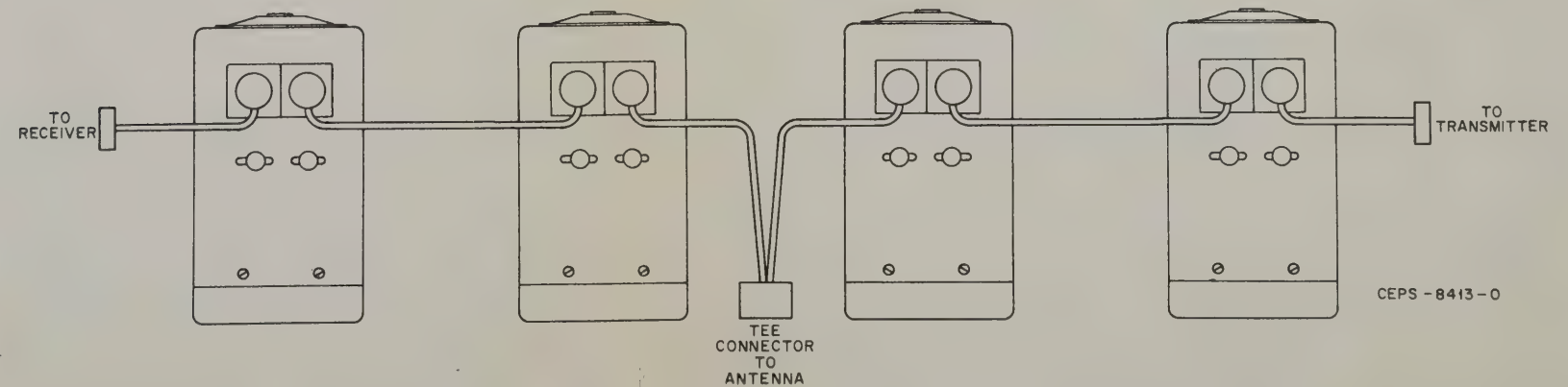
MODEL T1482A



MODEL T1485A



MODEL T1487A



CEPS-8413-0

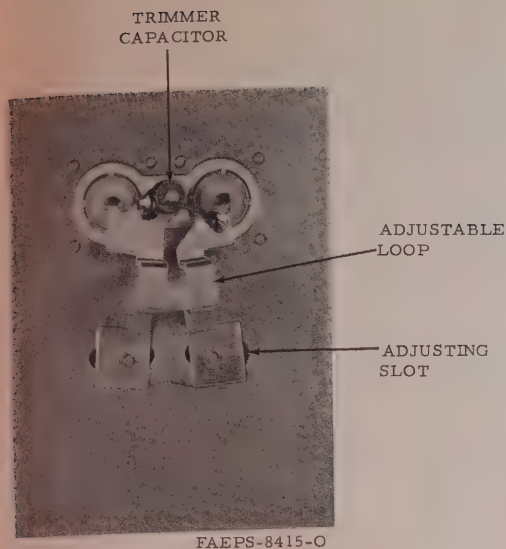


Figure 3.
Coupling Loop (Interior View)

(5) Maneuver both loops to the left so that the trimmer capacitor can fit through the left side of the hole and then remove the two loops together.

b. Replacement Procedure

(1) Insert the loop assembly into the mounting holes and maneuver both loops to the left so that the trimmer capacitor will fit through the left side of the hole.

(2) Position the loops so that the tapped holes in the end of the loops are visible through the adjusting slots.

(3) Insert the knurled adjusting screw, along with the nylon and lock washers, into the tapped hole.

(4) Attach the connectors to the can using the eight self-tapping screws making certain that the connector cable slot is facing in the proper direction to insert the cable.

(5) Insert the cable into the connector cable slot while pressing the center conductor into the center pin of the connector.

(6) Place the connector cover over the connector and solder the cable shield and connector cover to the connector.

5. RECOMMENDED TUNING PROCEDURE

All filters and duplexers are tuned to the customer-specified frequencies prior to shipment

from the factor. If system performance indicates that the duplexer is detuned, one of the following procedures may be used. Do not attempt to retune unless the following procedures have been read and it is certain that performance does not meet specifications.

The following tuning procedures assume that the entire duplexer is to be retuned. If it is desired to perform a minor "touch-up", refer to paragraph e. of this tuning procedure. When left and right are used in the following procedures, this shall mean facing the tuning shaft end and with the connectors facing up.

a. Method 1 (Models T1485A, AF and T1487A, AF)

(1) Recommended Test Equipment

(a) "Motorola Model R1201 Series Signal Generator.

(b) Tunable receiver or two "Motorola" receivers, one tuned to each of the frequencies to be duplexed.

(2) Tuning Procedure

(a) Move sliding screws as far apart as possible on each cavity and then tighten the screws.

(b) Turn trimmer capacitors fully counterclockwise.

(c) Tune the signal generator and the receiver to the duplex receive frequency.

(d) Connect the signal generator to the antenna port and the receiver to the right-hand port.

(e) Tune the right-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(f) Tune the signal generator and the receiver to the duplex transmit frequency.

(g) Connect the receiver to the left-hand port.

(h) Tune the left-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(i) Connect the receiver to the right-hand port.

(j) Tune the right-hand cavity(s) for maximum attenuation by using procedure 5.f., "Tuning the Notch".

(k) Tune the signal generator and the receiver to the duplex receive frequency.

(l) Connect the receiver to the left-hand port.

(m) Tune the left-hand cavity(s) for maximum attenuation by using procedure 5.f.

(n) Repeat steps (c) through (m), but only tune the trimmer capacitors when tuning the notches.

b. Method 2 (Models T1485A, AF and T1487A, AF)

(1) Recommended Test Equipment

(a) Mixer circuit constructed as shown in Figure 4.

(b) "Motorola" R1201 Series Signal Generator.

(c) IF output from R1201 Series Signal Generator equal to the duplex frequency separation or a "Motorola" S1056B Portable Test Set with a crystal frequency equal to the duplex frequency separation.

(d) "Motorola" S1350A Wattmeter.

(e) "Motorola" T1013A RF Load Resistor.

(f) Isolated Tee connector (construct this by removing the Tee port center pin of a UHF Tee connector). This provides 30 to 40 dB of isolation between the shunt path and the direct path through the Tee to protect the receiver when the transmitter is keyed.

(g) Transmitter and receiver from the station to be duplexed.

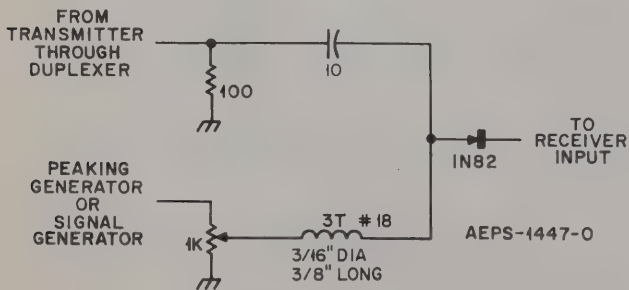


Figure 4.
Mixer Circuit

(2) Operation of the Mixer Circuit

Alignment of the duplexers can be simplified by using the mixer circuit shown in Figure 4. The mixer receives inputs from the transmitter and a low frequency source. The outputs from the mixer are frequencies above and below the transmitter frequency at separations equal to the output of the low frequency generator.

The receiver will respond to one of the mixer products and thus can be used indirectly to detect the transmitter frequency.

(3) Tuning Procedure

(a) Move sliding screws as far apart as possible on each cavity and then tighten the screws.

(b) Turn trimmer capacitors fully counterclockwise.

(c) Connect the equipment as shown in Figure 5.

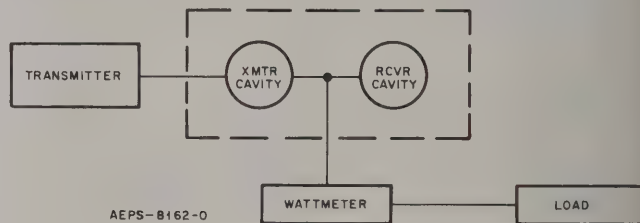


Figure 5.
Method 2 Transmitter Branch
Pass Test Set-Up

(d) Tune the left-hand cavity(s) for a maximum power reading on the wattmeter by adjusting the tuning rod screw.

(e) Connect the equipment as shown in Figure 6.

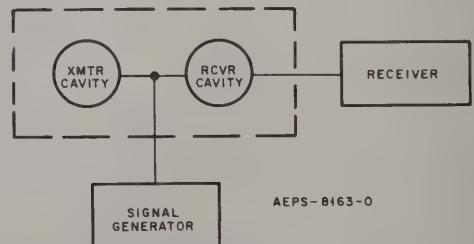


Figure 6.
Method 2 Receiver Branch
Pass Test Set-Up

(f) Tune the signal generator to the receive frequency.

(g) Tune the right-hand cavity(s) for a minimum insertion loss (maximum signal at the receiver) by adjusting the tuning rod screw.

(h) Connect the equipment as shown in Figure 7.

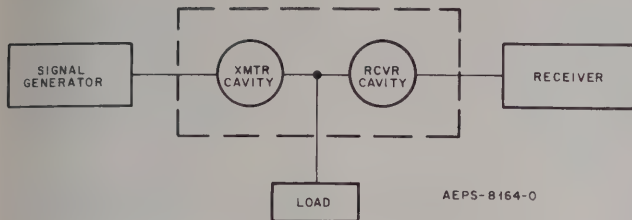


Figure 7.
Method 2 Transmitter Branch
Reject Test Set-Up

(i) Tune the left-hand cavity(s) for maximum attenuation by using procedure 5.f., "Tuning the Notch".

(j) Connect the equipment as shown in Figure 8.

(k) Set the local oscillator source to the exact duplex frequency separation.

(l) Tune the right-hand cavity(s) for maximum attenuation by using procedure 5.f.

(m) Repeat steps (c) through (l) but only tune the trimmer capacitors when tuning the notches.

(4) Connect the duplexer to the transmitter, receiver and antenna with 50-ohm coaxial cable. Adjust the transmitter final amplifier for rated power into the duplexer.

c. Model T1481A

This model may be tuned by using only steps (1) and steps (2)(a) through (e) and (j) and (k) of Method 1.

d. Model T1482A

(1) Recommended Test Equipment

(a) "Motorola" R1201 Series Signal Generator.

(b) Tunable receiver.

(2) Tuning Procedure

(a) Move sliding screws as far apart as possible on each cavity and then tighten the screws.

(b) Turn the trimmer capacitors fully counterclockwise.

(c) Tune the signal generator and the receiver to the pass frequency.

(d) Connect the equipment as shown in Figure 9.

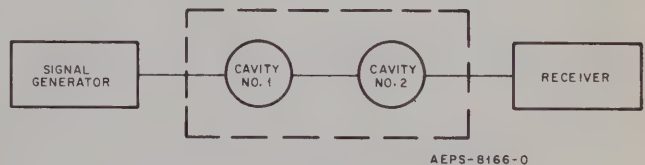


Figure 9.
Model T1482A Test Set-Up

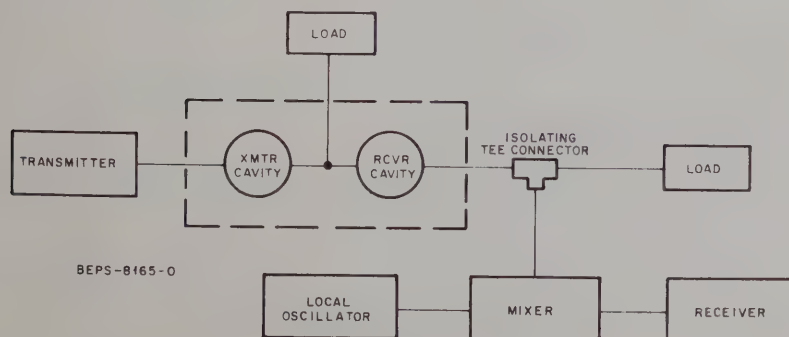


Figure 8.
Method 2 Receiver Branch Reject Test Set-Up

(e) Tune both cavities for minimum insertion loss by adjusting the tuning rod screw.

(f) Tune the signal generator and the receiver to the lower notch frequency.

(g) Tune the left-hand cavity for maximum attenuation by using procedure 5.f.

(h) Tune the signal generator and the receiver to the higher notch frequency.

(i) Tune the right-hand cavity for maximum attenuation by using procedure 5.f.

(j) Repeat steps (c) through (i) but only tune the trimmer capacitors when tuning the notches.

e. Minor "Touch-Up" Procedures (Models T1485A, AF and T1487A, AF)

(1) Method A

(a) Using the Recommended Test Equipment given for Method 1, tune the signal generator and the receiver to the duplex receive frequency.

(b) Connect the signal generator to the antenna port and the receiver to the right-hand port.

(c) Tune the right-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(d) Tune the signal generator and the receiver to the duplex transmit frequency.

(e) Connect the receiver to the left-hand port.

(f) Tune the left-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(g) Connect the receiver to the right-hand port.

(h) Tune the trimmer capacitor(s) on the right-hand cavity(s) for maximum attenuation.

(i) Tune the signal generator and the receiver to the duplex receive frequency.

(j) Connect the receiver to the left-hand port.

(k) Tune the trimmer capacitor(s) on the left-hand cavity(s) for maximum attenuation.

(2) Method B

(a) Using the Recommended Test Equipment given for Method 2, connect the equipment as shown in Figure 5.

(b) Tune the left-hand cavity(s) for a maximum power reading on the wattmeter by adjusting the tuning rod screw.

(c) Connect the equipment as shown in Figure 6.

(d) Tune the signal generator to the receive frequency.

(e) Tune the right-hand cavity(s) for a minimum insertion loss (maximum signal at the receiver) by adjusting the tuning rod screw.

(f) Connect the equipment as shown in Figure 7.

(g) Tune the trimmer capacitor(s) on the left-hand cavity(s) for maximum attenuation.

(h) Connect the equipment as shown in Figure 8.

(i) Set the local oscillator source to the exact duplex frequency separation.

(j) Tune the trimmer capacitor(s) on the right-hand cavity(s) for maximum attenuation.

f. Tuning the Notch

(1) If the Notch (Reject) Frequency is Below the Pass Frequency:

(a) Move the sliding screws as far apart as possible and then tighten the screws.

(b) Tune the trimmer capacitor for maximum attenuation at the notch frequency.

(2) If the Notch (Reject) Frequency is Above the Pass Frequency:

(a) Turn the trimmer capacitor completely counterclockwise and then clockwise two full turns.

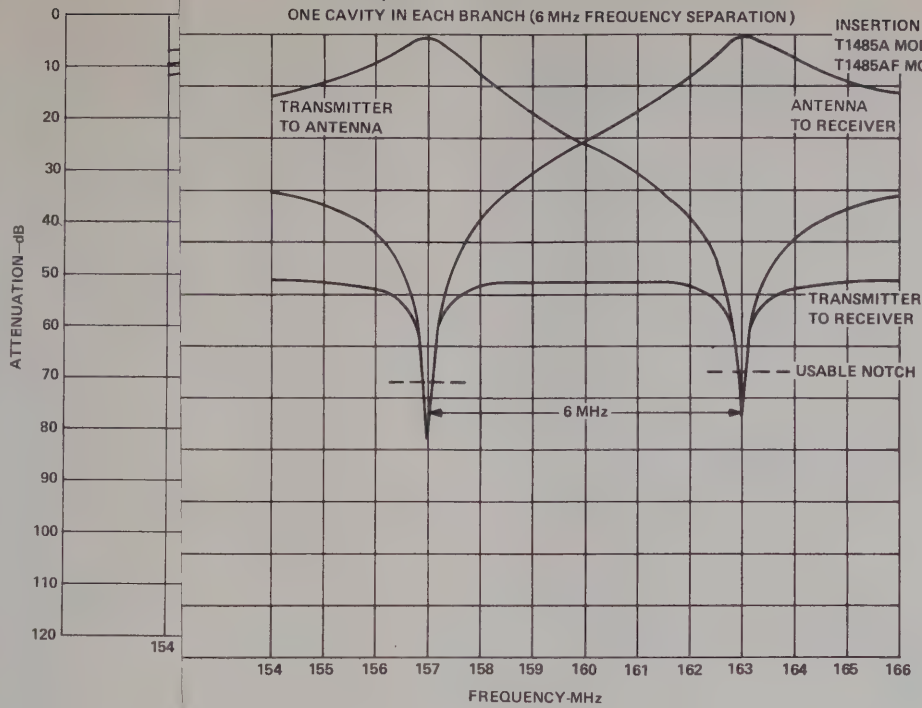
(b) Adjust the sliding screws for maximum attenuation at the notch frequency and then tighten the screws.

(c) Tune the trimmer capacitor for maximum attenuation at the notch frequency.

T1485A, AF PASS-REJECT DUPLEXER

ONE CAVITY IN EACH BRANCH (6 MHz FREQUENCY SEPARATION)

INSERTION LOSS = 0.7 dB FOR
T1485A MODEL & 0.9 dB FOR
T1485AF MODEL



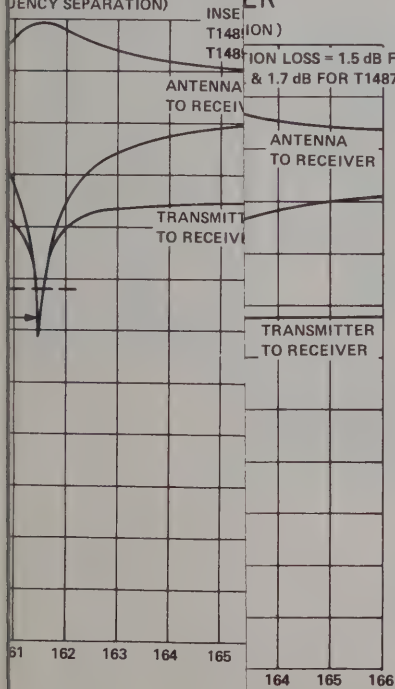
T DUPLEXER

JENCY SEPARATION)

ER

INSE
T148
T148

ION LOSS = 1.5 dB FOR T1487A
& 1.7 dB FOR T1487AF MODEL



EEPS-8176-O

(e) Tune both cavities for minimum insertion loss by adjusting the tuning rod screw.

(f) Tune the signal generator and the receiver to the lower notch frequency.

(g) Tune the left-hand cavity for maximum attenuation by using procedure 5.f.

(h) Tune the signal generator and the receiver to the higher notch frequency.

(i) Tune the right-hand cavity for maximum attenuation by using procedure 5.f.

(j) Repeat steps (c) through (i) but only tune the trimmer capacitors when tuning the notches.

e. Minor "Touch-Up" Procedures (Models T1485A, AF and T1487A, AF)

(1) Method A

(a) Using the Recommended Test Equipment given for Method 1, tune the signal generator and the receiver to the duplex receive frequency.

(b) Connect the signal generator to the antenna port and the receiver to the right-hand port.

(c) Tune the right-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(d) Tune the signal generator and the receiver to the duplex transmit frequency.

(e) Connect the receiver to the left-hand port.

(f) Tune the left-hand cavity(s) for minimum insertion loss by adjusting the tuning rod screw.

(g) Connect the receiver to the right-hand port.

(h) Tune the trimmer capacitor(s) on the right-hand cavity(s) for maximum attenuation.

(i) Tune the signal generator and the receiver to the duplex receive frequency.

(j) Connect the receiver to the left-hand port.

(k) Tune the trimmer capacitor(s) on the left-hand cavity(s) for maximum attenuation.

(2) Method B

(a) Using the Recommended Test Equipment given for Method 2, connect the equipment as shown in Figure 5.

(b) Tune the left-hand cavity(s) for a maximum power reading on the wattmeter by adjusting the tuning rod screw.

(c) Connect the equipment as shown in Figure 6.

(d) Tune the signal generator to the receive frequency.

(e) Tune the right-hand cavity(s) for a minimum insertion loss (maximum signal at the receiver) by adjusting the tuning rod screw.

(f) Connect the equipment as shown in Figure 7.

(g) Tune the trimmer capacitor(s) on the left-hand cavity(s) for maximum attenuation.

(h) Connect the equipment as shown in Figure 8.

(i) Set the local oscillator source to the exact duplex frequency separation.

(j) Tune the trimmer capacitor(s) on the right-hand cavity(s) for maximum attenuation.

f. Tuning the Notch

(1) If the Notch (Reject) Frequency is Below the Pass Frequency:

(a) Move the sliding screws as far apart as possible and then tighten the screws.

(b) Tune the trimmer capacitor for maximum attenuation at the notch frequency.

(2) If the Notch (Reject) Frequency is Above the Pass Frequency:

(a) Turn the trimmer capacitor completely counterclockwise and then clockwise two full turns.

(b) Adjust the sliding screws for maximum attenuation at the notch frequency and then tighten the screws.

(c) Tune the trimmer capacitor for maximum attenuation at the notch frequency.

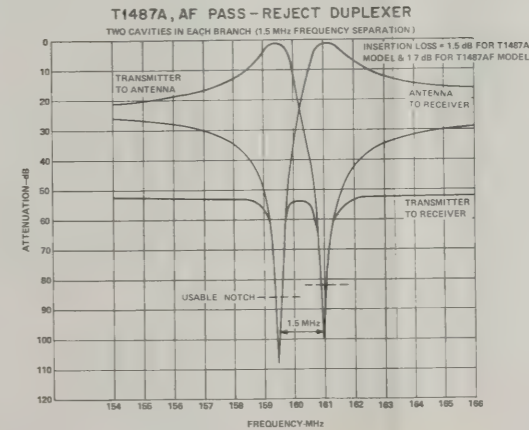
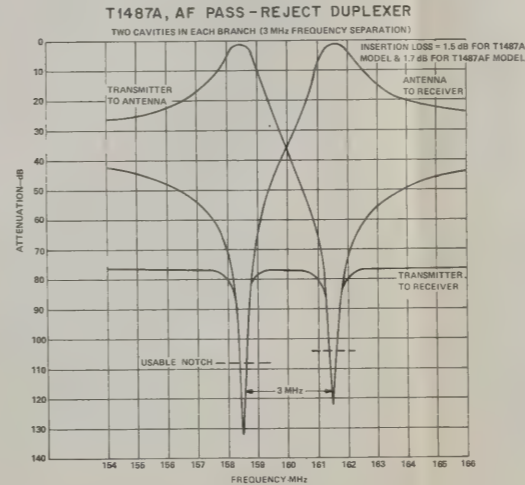
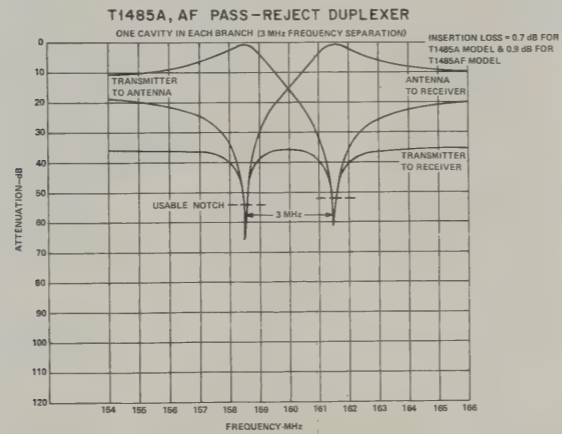
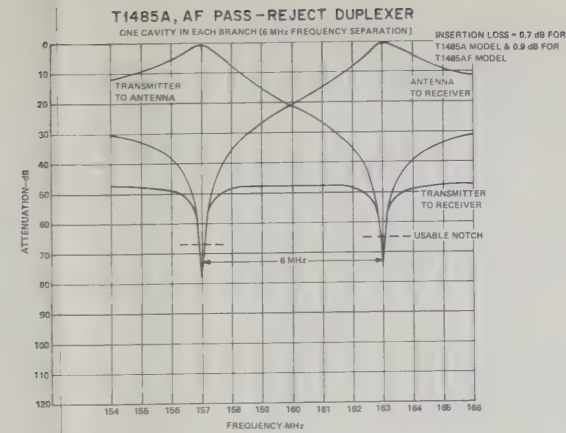
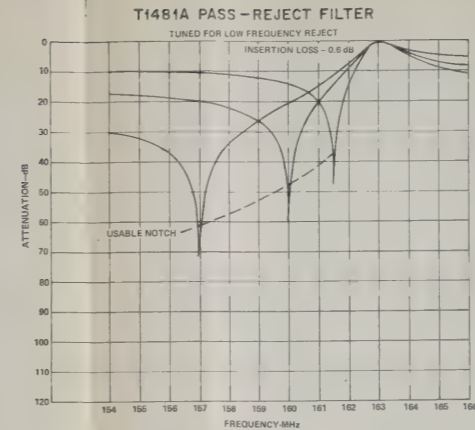
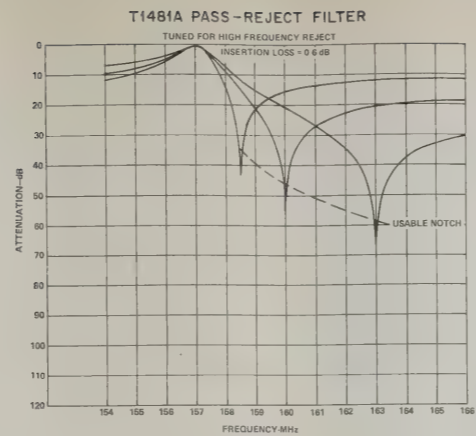
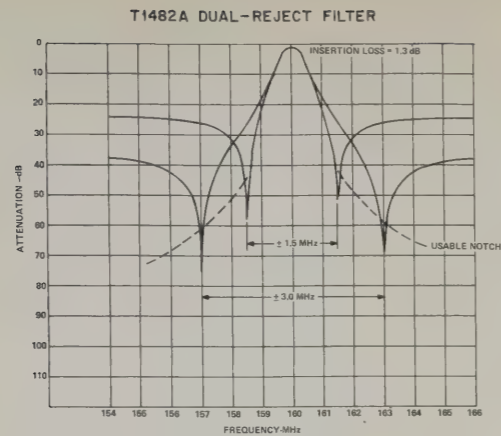


Figure 10.
Typical Filter & Duplexer Selectivity Curves

"COMPA-STATION" METERING & INTERCOM

MODELS TLN1857A AND TLN1886A INTERCOM MODEL TLN1745A

FUNCTION

--Models TLN1857A and TLN1886A provide built-in metering of over 20 major test points in the transmitter and receiver(s), plus intercom between the station and the remote control point.

--Model TLN1745A provides intercom between the station and the remote control point.

METER SELECT TABLE

R	LOW BAND-MID BAND TLN1886A/TLN1887A			HIGH BAND TLN1857/TLN1859A		820 MHz/UHF TLN1857A/TLN1859A	
	OS.	POL.	FUNCTION METERED	PCL.	FUNCTION METERED	POL.	FUNCTION METERED
		REV	EXTENDER CHANNEL ELEMENT	REV	—	FWD	CHANNEL ELEMENT OUTPUT
		REV	—	REV	—	FWD	FIRST DOUBLER OUTPUT
		REV	CHANNEL ELEMENT OUTPUT	REV	CHANNEL ELEMENT OUTPUT	FWD	SECOND DOUBLER OUTPUT
		REV	DISCRIMINATOR OUTPUT	REV	DISCRIMINATOR OUTPUT	FWD	DISCRIMINATOR OUTPUT
		REV	DISCRIMINATOR OUTPUT	REV	DISCRIMINATOR OUTPUT	FWD	DISCRIMINATOR OUTPUT
		REV	THIRD IF OUTPUT AND LIMITER OUTPUT	REV	THIRD IF OUTPUT AND LIMITER OUTPUT	FWD	LIMITER OUTPUT
		FWD	P.A. INPUT	REV	PA INPUT	FWD	PREDRIVER CURRENT
		FWD	—	REV	CONTROLLED AMP OUTPUT	FWD	25 W DRIVER CURRENT (75 W)
		FWD	—	REV	INPUT FINAL AMP	FWD	FINAL AMP CURRENT (EXCEPT 12 W MODELS)
		FWD	CONTROL VOLTAGE	REV	90/100 W/60 W PREDRIVER INPUT FINAL AMP.	FWD	CONTROLLED (ADL) STAGE VOLTAGE
		FWD	FINAL AMPLIFIER CURRENT	REV	FINAL AMPLIFIER CURRENT	FWD	FINAL AMPLIFIER CURRENT (12 W ONLY)
2		FWD	CONTROL VOLTAGE	FWD	CONTROL VOLTAGE	FWD	ADL VOLTAGE (ALL OTHERS)
3		FWD	—	FWD	—	FWD	ADL VOLTAGE NOT USED (800 MHz ONLY)
4		FWD	REFLECTED POWER	FWD	REFLECTED POWER	FWD	REFLECTED POWER
5		FWD	FORWARD POWER	FWD	FORWARD POWER	FWD	FORWARD POWER
6			UNUSED		UNUSED		UNUSED
7		FWD	SECOND AMPLIFIER - (LB) DRIVER INPUT - (MB)	FWD	EXCITER OUTPUT	FWD	EXCITER OUTPUT
8		FWD	FIRST AMPLIFIER - (LB) DOUBLER INPUT - (MB)	FWD	FIRST DOUBLER INPUT	FWD	DOUBLER INPUT
9		FWD	TRIPLER INPUT	FWD	TRIPLER INPUT	FWD	TRIPLER INPUT
10		FWD	CHANNEL ELEMENT OUTPUT	FWD	CHANNEL ELEMENT OUTPUT	FWD	CHANNEL ELEMENT OUTPUT
11		FWD	IDC AUDIO OUTPUT	FWD	IDC AUDIO OUTPUT	FWD	IDC AUDIO OUTPUT
12		FWD	25 VOLTS FULL SCALE	FWD	25 VOLTS FULL SCALE	FWD	25 VOLTS FULL SCALE
13		FWD	5 VOLTS FULL SCALE	FWD	5 VOLTS FULL SCALE	FWD	5 VOLTS FULL SCALE
			NOTE: METER IS LABELLED 0-50		NOTE: METER IS LABELLED 0-50		NOTE: METER IS LABELLED 0-50
14			OFF		OFF		OFF

EPS-23014-A

68P81033E28-F
(Sheet 2 of 3)
6/20/80-PHI

"COMPA-STATION" METERING & INTERCOM

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5901A Meter Kit
TLN5994A Meter Kit

NOTE

This parts list covers two meter kits. Where differences appear the model number of the applicable kit is indicated in the description column.

PL-5078-O

CR1	48-82392B03	DIODE: (SEE NOTE) silicon
J1	9-830418	CONNECTOR, receptacle: 4-contact
Q1	48-869571	TRANSISTOR: (SEE NOTE) PNP; type M9571
P100	29-82676C01	CONNECTOR, plug: test probe; BLACK
P101	29-82676C02	test probe; RED
P102	28-84208B01	7-contact
R1		RESISTOR, fixed: $\pm 10\%$; 1/2 W: unless otherwise stated
R2	17-82177B04	NOT USED
R3	6-124A33	5; 5 W
R4, 10	6-84640C61	220
R5	6-125C17	499k $\pm 1\%$
R6	6-124A77	47
R7	6-124A57	15k $\pm 5\%$; 1/4 W
R8	6-125C15	2.2k $\pm 5\%$; 1/4 W
R9	6-125A39	39
R11	6-12756D88	390
R12	6-125A33	100k $\pm 1\%$
S1	40-83158C01	220 $\pm 5\%$
S2, 3	40-83890A01	SWITCH: rotary; 2 section
S4	40-811751	slide; dpdt
S5	40-83890A01	toggle; dpdt
		slide; dpdt
NON-REFERENCED ITEMS		
	1-80775B55	CABLE ASSEMBLY includes:
	3-129674	SCREW, machine: 4-40 x 3/16"; 2 used
	3-132341	SCREW, machine: 4-36 x 1/4"; 2 used
	15-83947K01	COVER, connector: 2 used
	30-83678K01	CLAMP, cable; 2 used
	1-80775B60	CONNECTOR P102
		VOLTMETER PROBES
		includes:
		CONNECTORS P100 & P101
	1-80792B39	SWITCH ASSEMBLY, wired (TLN5901A)
	1-80795B12	SWITCH ASSEMBLY, wired (TLN5994A) includes:
		SWITCH S1
	1-80793B03	CHASSIS ASSEMBLY includes:
	4-7555	WASHER, flat: .128 x .250 x .033"; 3 used
	27-83400K02	CHASSIS, metering
	29-115147	LUG, soldering: #5
	31-490101	TERMINAL STRIP: 2-termin- al; 2 used
	42-871184	CLIP, mounting; 3 used
	2-7018	NUT, hex: 3/8-32 x 1/2 x 3/32
	2-115190	NUT, hex: 15/32-32 x 9/16 x 5/64"
	2-121841	NUT, hex: 6-32 x 5/16 x 7/64"
	2-83896G01	NUT, special: 13/16-27 x .905 x .110"
	3-134185	SCREW, tapping: 6-32 x 1/4; 2 used
	3-134212	SCREW, tapping: 4-40 x 5/16; 3 used
	3-136934	SCREW, tapping: 6-32 x 3/8"
	4-7698	WASHER, lock: #3/8 (internal tooth)
	4-7699	WASHER, lock: #13/16 (internal tooth)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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	4-8324	WASHER, lock: #15/32 (split)
	14-84717F01	INSULATOR: .68 x .40"
	29-5279	LUG, soldering: #7/8
	31-835961	TERMINAL STRIP, 18-termin- al
	36-82630H01	KNOB, control
	42-890499	CLAMP, cable: 3.18 x .62"
	42-10217A02	STRAP, cable harness

TKN6886A Cable Kit

PL-5207-A

P4	-	CONNECTOR: includes:
	9-84151B03	CONTACT, receptacle: 12 used
	14-84556B02	HOUSING, connector
NON-REFERENCED ITEMS		
	14-859051	INSULATOR, lug: .315 x .945"; 6 used
	29-5247	LUG, soldering: #1/4 L; 4 used
	29-824456	LUG, ring tongue: 2 used
	29-859118	LUG, receptacle: .295 x .750"; 6 used
	37-82603D60	SLEEVE, numbered; blank
	39-10184A24	CONTACT, female
	42-10217A02	STRAP, cable harness; 3.62" lg.; 28 used
	42-10217A10	STRAP, cable harness; 7.78" lg.; 4 used
	9-84234E10	JACK, test; white; 3 used

TLN5134A Meter Panel

PL-2233

DS1	65-83183G02	LIGHT, indicator:
DS2	65-83183G04	includes lamp and GRN lens
		includes lamp and RED lens
LS1	50-83562A01	LOUDSPEAKER, permanent magnet; dynamic type; 4"; square; 4 ohms voice coil impedance
M1	72-84864B10	METER, electrical: 50 uA
M2	72-84864B09	movements: scale: 0-25 volts/amps scale: 0-50 microamperes
NON-REFERENCED ITEMS		
	13-84616G01	GRILLE, speaker
	13-83207F01	CLOTH, speaker grille
	42-83112A01	CLIP, indicator light retaining; 2 used
	2-7009	NUT, hex: 10-32 x 3/8 x 1/8"; 4 used
	3-119916	SCREW, machine: 10-32 x 7/16; 4 used
	3-131964	SCREW, tapping: 6-32 x 3/8; 12 used
	4-7658	WASHER, lock: #10 (split); 4 used
	7-84620G01	FRAME, top
	7-84620G03	FRAME, bottom
	7-84620G05	FRAME, end: 2 used
	13-83054C10	GRILLE, meter panel
	64-83152C03	PANEL, meter

STATION HARDWARE AND POWER CABLE KITS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5896A Hardware Kit, 1-Receiver
TLN5897A Hardware Kit, 2-Receiver

NOTE

This parts list covers two receiver hardware kits. Where differences appear the model number of the applicable kits is indicated in the description column.

PL-5146-O

	1-80709B39	SHIELD ASSEMBLY, receiver (TLN5896A 1 used; TLN5897A 2 used) includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84081C04	INSERT, shield
	26-84405B01	SHIELD, receiver
	41-84811B01	SPRING, ground
	46-84090C01	STUD, retainer; 4 used
	1-80728B57	SHIELD ASSEMBLY, Audio & Squelch (TLN5896A 1 used; TLN5897A 2 used) includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84043E01	SHIELD (4-hole)
	26-84981F01	SHIELD (2-hole)
	46-84090C01	STUD, retainer
	1-80731B73	SHIELD ASSEMBLY, Exciter includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84053E01	SHIELD, exciter
	26-84053E04	INSERT
	46-84090C01	STUD, retainer; 4 used
	1-80775B77	BRACKET ASSEMBLY includes:
	7-82898K01	BRACKET, connector mtg.

	1-80792B92	COVER ASSEMBLY, channel element (TLN5896A 1 used; TLN5897A 2 used) includes:
	1-80792B93	COVER SUBASSEMBLY includes:
	64-82673L02	COVER
	3-138162	SCREW, tapping; 4-40 x 3/8"; 4 used
	42-84284B01	RETAINER, screw; 4 used
	75-82902K01	PAD, rubber
	2-119913	NUT, hex; 8-32 x 11/32 x 1/8"; 3 used
	2-82360B07	NUT, speed; 1/4 - 14 (TLN5896A 18 used; TLN5897A 22 used)
	3-122777	SCREW, machine; 8-32 x 1/2"; 3 used
	3-134268	SCREW, tapping; 4-40 x 7/16"; 2 used
	3-135038	SCREW, tapping; 1/4-14 x 3/4" (TLN5896A 18 used; TLN5897A 22 used)
	3-138162	SCREW, tapping; 4-40 x 3/8"
	3-139495	SCREW, tapping; 6-20 x 5/16" 2 used
	7-82683K01	BRACKET, filter
	13-813618	DECAL, patent number
	14-82903K01	INSULATOR; 2.68 x 1.25"
	26-82911K01	HEAT SINK
	33-83051K01	NAMEPLATE
	42-10217A02	STRAP, cable harness; 3.67" lg.; 10 used
	42-10217A10	STRAP, cable harness; 7.78" lg.; 3 used
	42-84284B01	RETAINER, screw
	54-842366	LABEL, replacement parts
	54-850440	LABEL, FCC
	54-83040C01	LABEL, audio
	54-84857B01	LABEL, wattmeter
	55-84300B01	HANDLE; (TLN5896A 4 used; TLN5897A 6 used)
	66-84387C01	TOOL, universal tuning
	66-84690C01	TOOL, contact removal



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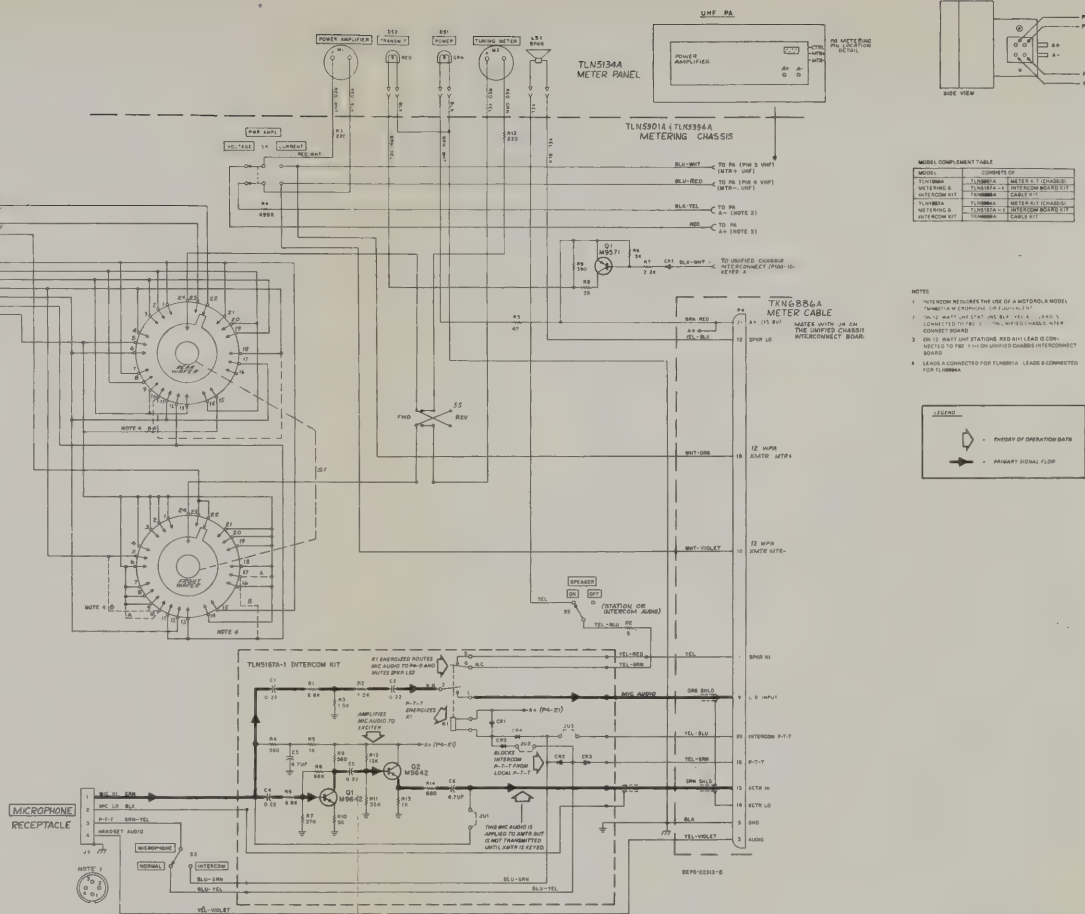
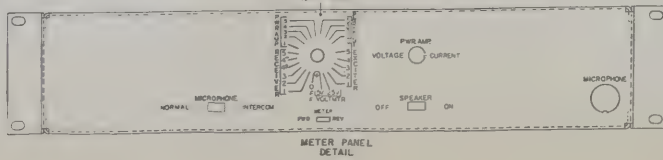
UPRIGHT STATION
METERING & INTERCOM
MODELS TLN1859A AND TLN1887A

FUNCTION

Provides built-in metering of over 20 major test points in the transmitter and receiver(s). Plus intercom between the station and the remote control point.

METER SELECT TABLE									
P102 METER PLUGS CONNECTED	METER SELECTOR SWITCH			LOW BAND MID BAND TLN1886A/TLN1887A		HIGH BAND TLN1887/TLN1888A		820 MHz UHF TLN1887A/TLN1888A	
	MTR. NO.	POS.	POL.	FUNCTION METERED	PCL.	FUNCTION METERED	POL.	FUNCTION METERED	PCL.
RCVR AND IF BOARD	RCVR	1 1	REV	EXTENDER CHANNEL ELEMENT	REV	—	FWD	CHANNEL ELEMENT OUTPUT	FWD
		2 2	REV	CHANNEL ELEMENT OUTPUT	REV	CHANNEL ELEMENT OUTPUT	FWD	FIRST DOUBLER OUTPUT	FWD
		3 3	REV	CHANNEL ELEMENT OUTPUT	REV	CHANNEL ELEMENT OUTPUT	FWD	SECOND DOUBLER OUTPUT	FWD
		4 4	REV	DISCRIMINATOR OUTPUT	REV	DISCRIMINATOR OUTPUT	FWD	DISCRIMINATOR OUTPUT	FWD
		5 5	REV	DISCRIMINATOR OUTPUT	REV	DISCRIMINATOR OUTPUT	FWD	DISCRIMINATOR OUTPUT	FWD
PWR AMP	PWR AMP	1 1	FWD	P.A. INPUT	REV	PA INPUT	FWD	PREDRIVER CURRENT	FWD
		2 2	FWD	—	REV	CONTROLLED AMP OUTPUT	FWD	25 W DRIVER CURRENT (15 W)	FWD
		3 3	FWD	—	REV	INPUT FINAL AMP	FWD	FINAL AMP CURRENT (EXCEPT 12 W MODELS)	FWD
		4 10	FWD	CONTROL VOLTAGE	REV	INPUT FINAL AMP	FWD	CONTROLLED IADL STAGE VOLTAGE	FWD
		5 11	FWD	FINAL AMPLIFIER CURRENT	REV	INPUT FINAL AMP	FWD	FINAL AMPLIFIER CURRENT	FWD
POWER CONTROL BOARD	POWER CONT.	5 12	FWD	CONTROL VOLTAGE	FWD	CONTROL VOLTAGE	FWD	ADL VOLTAGE (ALL OTHERS)	FWD
		6 13	FWD	—	FWD	ADL VOLTAGE NOT USED	FWD	ADL VOLTAGE NOT USED	FWD
		7 14	FWD	REFLECTED POWER	FWD	REFLECTED POWER	FWD	REFLECTED POWER	FWD
		8 15	FWD	FORWARD POWER	FWD	FORWARD POWER	FWD	FORWARD POWER	FWD
		9 16	UNUSED	—	UNUSED	—	UNUSED	—	UNUSED
EXCITER	EXCITER	5 17	FWD	SECOND AMPLIFIER - I/O	FWD	EXCITER OUTPUT	FWD	EXCITER OUTPUT	FWD
		6 18	FWD	DRIVER INPUT - (IMB)	FWD	FIRST DOUBLER INPUT	FWD	DOUBLER INPUT	FWD
		7 19	FWD	TRIPLER INPUT - (IMB)	FWD	TRIPLER INPUT	FWD	TRIPLER INPUT	FWD
		8 20	FWD	CHANNEL ELEMENT OUTPUT	FWD	CHANNEL ELEMENT OUTPUT	FWD	CHANNEL ELEMENT OUTPUT	FWD
		9 21	FWD	IDC AUDIO OUTPUT	FWD	IDC AUDIO OUTPUT	FWD	IDC AUDIO OUTPUT	FWD
VOLT METER	VOLT METER	25 22	FWD	25 VOLTS FULL SCALE	FWD	25 VOLTS FULL SCALE	FWD	25 VOLTS FULL SCALE	FWD
		5 23	FWD	5 VOLTS FULL SCALE	FWD	5 VOLTS FULL SCALE	FWD	5 VOLTS FULL SCALE	FWD
DEF	DEF	24	OFF	OFF	OFF	OFF	OFF	OFF	OFF

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(Sheet 3 of 3)
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OPERATING INSTRUCTIONS

1. METERING

Step 1. Tuning Meter Usage -- Select the function to be metered with the meter switch. Next, select the chassis to be monitored by placing the metering plug (P102) into the metering receptacle of the receiver, exciter, power control board, or the power amplifier. NOTE: Metering plug P102 should be plugged in only when tuning. Unplug it when it is not being used. For receiver discriminator adjustment, use both 4(+) and 4(-) and adjust for meter zero.

Step 2. PWR AMP Meter Usage -- Select PA current/voltage monitoring by placing the VOLTAGE/CURRENT switch in the applicable position.

Step 3. Refer to the Transmitter and Receiver sections of this manual for typical or minimum readings. Better yet, keep a log of all meter readings each time the station is serviced. Use the last set of readings as a reference and note any degradation in performance.

Step 4. Voltmeter Usage -- Use either the 5 V or 25 V scales as applicable. Divide the 5 V full scale reading by 10 to obtain actual voltage. Divide the 25 V full scale reading by 2 to obtain actual voltage.

2. INTERCOM

Step 1. Connect a test microphone to the microphone receptacle on the meter & intercom chassis.

Step 2. Place the SPEAKER switch in the ON position.

Step 3. Place the NORMAL-INTERCOM switch in the INTERCOM position.

Step 4. The unit is now ready for intercom operation between the station and the remote control point. Close the PUSH-TO-TALK switch on the microphone and speak into the microphone to send a message. Release the button to listen; replies will be heard in the speaker. The console operator at the remote point must also switch to an intercom mode to prevent keying the station during replies.

Step 5. Return the SPEAKER switch to the OFF position before leaving the station unattended.

3. "ON-THE-AIR" TESTING

Step 1. Connect a test microphone to the microphone receptacle on the meter & intercom chassis.

Step 2. Place the SPEAKER switch in the ON position.

Step 3. Place the NORMAL-INTERCOM in the NORMAL position.

Step 4. The unit is now ready for "on-the-air" testing. If the microphone PUSH-TO-TALK switch is closed,

the station's transmitter will be keyed. Speak into the microphone to transmit a message. Release the PUSH-TO-TALK switch to listen. Receiver audio will be heard on the speaker.

Step 5. Return the SPEAKER switch to OFF before leaving the station unattended.

4. MONITORING

To monitor audio quality, etc., place the SPEAKER switch in the ON position. Both receiver audio and line audio from the remote control point will be heard in the speaker.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
PARTS LIST					
TLN5901A Meter Kit TLN5994A Meter Kit					
NOTE This parts list covers two meter kits. Where differences appear the model number of the applicable kit is indicated in the description column.					
CR1	48-82392B03	DIODE (SEE NOTE) silicon	4-8324	WASHER, lock: #15/32 (split)	
J1	9-830418	CONNECTOR, receptacle: 4-contact	14-84717F01	INSULATOR, .58 x .50	
Q1	48-869571	TRANSISTOR (SEE NOTE) PNP; type M9571	29-5279	LUG, soldering: #7/8	
P100	29-82670C01	CONNECTOR, plug: 14-84556B02	31-835961	TERMINAL STRIP, 18-term:	
P101	29-82676C02	test probe: BLACK	36-82630H01	KNOB, control	
P102	28-84208B01	test probe: RED	42-890499	CLAMP, cable: 3.18 x .62	
R1	17-82177B04	RESISTOR, fixed, 100k, 1/2 W	42-10217A02	STRAP, cable harness	
R2	6-124A33	unless otherwise stated			
R3	6-84640C61	NOT USED			
R4, 10	6-125C17	5: 5 W			
R5	6-124A33	499k ±1%			
R6	6-124A33	10k ±1%, 1/4 W			
R7	6-124A33	2.2k ±5%; 1/4 W			
R8	6-125C15	39			
R9	6-125A39	390			
R11	6-12756D88	100k ±1%			
R12	6-125A33	220 ±5%			
S1	40-83158C01	SWITCH: rotary; 2 section			
S2, 3	40-83890A01	slide; dpdt			
S4	40-811751	toggle; dpdt			
S5	40-83890A01	slide; dpdt			
NON-REFERENCED ITEMS					
1-80775B55	3-129674	CABLE ASSEMBLY includes: SCREW, machine: 4-40 x 3/16"; 2 used	TLN5134A Meter Panel	PL-22	
3-132341	15-83947K01	SCREW, machine: 4-36 x 1/8" 2 used	DS1	65-83183G02	LIGHT, indicator: includes lamp and GRN lens
30-83678K01	1-80775B60	COVER, connector: 2 used	DS2	65-83183G04	includes lamp and RED lens
1-80775B60	1-80792B10	CONNECTOR P102	LS1	50-83562A01	LOUDSPEAKER, permanent
1-80792B10	1-80795B12	SWITCH ASSEMBLY, wired (TLN5901A)			
1-80795B12	4-7555	SWITCH ASSEMBLY, wired (TLN5994A) includes: SWITCH S1			
1-80793B03	27-83400K02	CHASSIS ASSEMBLY includes: WASHER, flat: .128 x .250 x .033"; 3 used	M1	72-84864B10	METER, electrical: 50 uA
4-7555	29-115147	CHASSIS, metering	M2	72-84864B09	movements: scale: 0-25 volts/amps scale: 0-50 microamperes
27-83400K02	31-490101	LUG, soldering: #5			
29-115147	42-871184	TERMINAL STRIP; 2-terminal; 2 used			
31-490101	2-121841	CLIP, mounting: 3 used			
42-871184	2-83896G01	NUT, hex: 3/8-32 x 1/2 x 3/32			
2-121841	3-134185	NUT, hex: 15/32-32 x 9/16 x 5/64"			
2-83896G01	3-134212	NUT, hex: 6-32 x 5/16 x 7/64"			
	3-136934	NUT, special: 13/16-27 x .905 x .110"			
	4-7698	SCREW, tapping: 6-32 x 1/4; 2 used			
	4-7699	SCREW, tapping: 4-40 x 5/16; 3 used			
	4-7699	SCREW, tapping: 6-32 x 3/8" WASHER, lock: #3/8 (internal tooth)			
		WASHER, lock: #13/16 (internal tooth)			

STATION HARDWARE AND POWER CABLE KITS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5896A Hardware Kit, 1-Receiver
TLN5897A Hardware Kit, 2-Receiver

NOTE

This parts list covers two receiver hardware kits. Where differences appear the model number of the applicable kits is indicated in the description column.

PL-5146-O

	1-80709B39	SHIELD ASSEMBLY, receiver (TLN5896A 1 used; TLN5897A 2 used) includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84081C04	INSERT, shield
	26-84405B01	SHIELD, receiver
	41-84811B01	SPRING, ground
	46-84090C01	STUD, retainer; 4 used
	1-80728B57	SHIELD ASSEMBLY, Audio & Squelch (TLN5896A 1 used; TLN5897A 2 used) includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84043E01	SHIELD (4-hole)
	26-84981F01	SHIELD (2-hole)
	46-84090C01	STUD, retainer
	1-80731B73	SHIELD ASSEMBLY, Exciter includes:
	2-10101A53	NUT, spring; .280 x .020"; 4 used
	26-84053E01	SHIELD, exciter
	26-84053E04	INSERT
	46-84090C01	STUD, retainer; 4 used
	1-80775B77	BRACKET ASSEMBLY includes:
	7-82898K01	BRACKET, connector mtg.

	1-80792B92	COVER ASSEMBLY, channel element (TLN5896A 1 used; TLN5897A 2 used) includes:
	1-80792B93	COVER SUBASSEMBLY includes:
	64-82673L02	COVER
	3-138162	SCREW, tapping; 4-40 x 3/8"; 4 used
	42-84284B01	RETAINER, screw; 4 used
	75-82902K01	PAD, rubber
	2-119913	NUT, hex; 8-32 x 11/32 x 1/8"; 3 used
	2-82360B07	NUT, speed; 1/4 - 14 (TLN5896A 18 used; TLN5897A 22 used)
	3-122777	SCREW, machine; 8-32 x 1/2"; 3 used
	3-134268	SCREW, tapping; 4-40 x 7/16"; 2 used
	3-135038	SCREW, tapping; 1/4-14 x 3/4" (TLN5896A 18 used; TLN5897A 22 used)
	3-138162	SCREW, tapping; 4-40 x 3/8"
	3-139495	SCREW, tapping; 6-20 x 5/16" 2 used
	7-82683K01	BRACKET, filter
	13-813618	DECAL, patent number
	14-82903K01	INSULATOR; 2.68 x 1.25"
	26-82911K01	HEAT SINK
	33-83051K01	NAMEPLATE
	42-10217A02	STRAP, cable harness; 3.67" lg.; 10 used
	42-10217A10	STRAP, cable harness; 7.78" lg.; 3 used
	42-84284B01	RETAINER, screw
	54-842366	LABEL, replacement parts
	54-850440	LABEL, FCC
	54-83040C01	LABEL, audio
	54-84857B01	LABEL, wattmeter
	55-84300B01	HANDLE; (TLN5896A 4 used; TLN5897A 6 used)
	66-84387C01	TOOL, universal tuning
	66-84690C01	TOOL, contact removal



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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TRN6976A Hardware Kit, 1-Receiver
TRN6977A Hardware Kit, 2-Receiver

NOTE

This parts list covers 1- & 2-Receiver Hardware Kits.
Where differences exist the model number of the applicable unit is given in the Description column. PL-5513-O

1-80709B39	SHIELD ASSEMBLY, Receiver
2-10101A53	TRN6976A 1 used,
26-84081C04	TRN6977A 2 used includes:
26-84405B01	NUT, spring: 4 used
41-84811B01	INSERT
46-84090C01	SHIELD, receiver
1-80728B57	SPRING
	STUD, retainer: 4 used
	SHIELD ASSEMBLY, Audio &
	Squelch: TRN6976A 1 used,
	TRN6977A 2 used includes:
2-10101A53	NUT, spring: 4 used
26-84981F01	SHIELD
46-84090C01	STUD, retainer: 4 used
1-80731B73	SHIELD ASSEMBLY, Exciter
	includes:
2-10101A53	NUT, spring: 4 used
26-84053E01	SHIELD
26-84053E04	INSERT
46-84090C01	STUD, retainer: 4 used
1-80792B92	COVER ASSEMBLY, Receiver
	Channel Element: TRN6976A
	1 used, TRN6977A 2 used
	includes:
1-80792B93	COVER SUBASSEMBLY
	includes:
64-82673L02	COVER
3-138162	SCREW, tapping: 4-40 x
	3/8"; 4 used
42-84284B01	RETAINER: 4 used
75-82902K01	PAD (rubber)
1-80797B35	PANEL ASSEMBLY, filter
	includes:
64-82673L03	PANEL
2-119913	NUT, hex: 8-32 x 11/32 x 1/8"
	3 used
2-82360B07	NUT, speed: TRN6976A 12
	used; TRN6977A 16 used
3-122777	SCREW, machine: 8-32 x 1/2:
	3 used
3-134268	SCREW, tapping: 4-40 x 7/16"
	2 used
3-135038	SCREW, tapping: 1/4-14 x
	3/4"; TRN6976A 12 used,
	TRN6977A 16 used
3-138162	SCREW, tapping: 4-40 x 3/8"
	4 used
3-139495	SCREW, tapping: 6-20 x 5/16"
	2 used
3-82227A02	SCREW, machine: 4-40 x
	7/16"; 4 used
7-82683K01	BRACKET, filter
13-813618	DECAL, patent number
14-82903K01	INSULATOR: 2.68 x 1.25"
26-82911K01	HEAT SINK
26-83270L01	SHIELD, Power Control Board
33-83051K01	NAMEPLATE
42-10217A02	STRAP, tie: .091 x 3.62";
	10 used
42-10217A10	STRAP, tie: .184 x 7.78";
	3 used
42-84284B01	RETAINER, screw: 4 used
54-842366	LABEL, replacement parts
54-850440	LABEL, FCC
54-83040C01	LABEL, audio
54-84857B01	LABEL, wattmeter
55-84300B01	HANDLE: 3.52" long;
	TRN6976A 4 used, TRN6977A
	6 used
55-84300B02	HANDLE: 2.12" long
66-84387C01	TOOL, universal tuning
66-84690C01	TOOL, contact removal

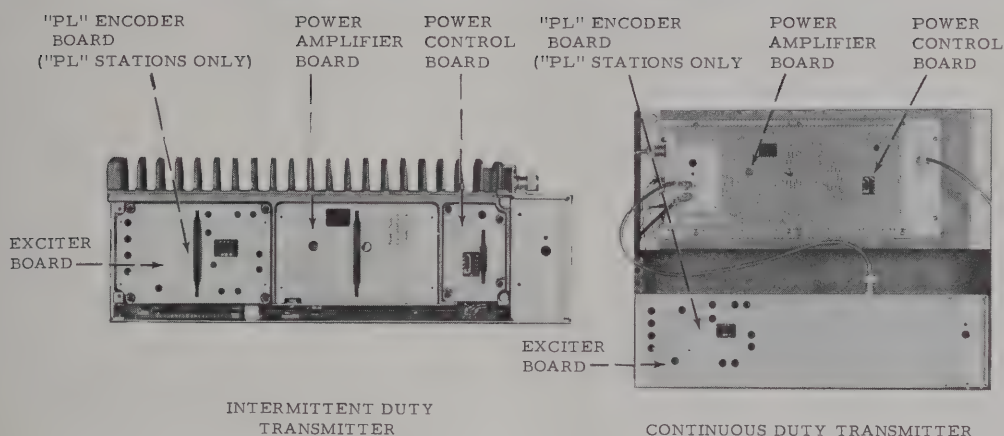
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

TKN6937A Cable Kit, Power

PL-5517-O

1-80797B40	LEAD & LUG ASSEMBLY
29-824151	includes:
29-10210A10	LUG, slotted tongue: 2 used
	TERMINAL, crimp: #6
	(yellow); 2 used
30-813233	CABLE, battery: #10 (red)
	33" long
30-831572	CABLE, battery: #10 (black)

TRANSMITTER INTRODUCTION



AEPS-9231-O

Intermittent or continuous duty version transmitters can be used in the Motorola "Micor" "Compa-Station" base and repeater stations. Transmitter model breakdown is shown in the model charts at the end of this section. Intermittent duty versions provide 60-, 90-, or 110-watt capability with a 20% duty cycle (1 minute ON followed by 4 minutes OFF). Continuous duty versions provide 60-, 90-, or 100-watt capability with no OFF time required except as dictated by operating procedure. Intermittent duty stations require less space than continuous duty stations and are mounted in smaller cabinets. Extra space is required in continuous duty stations to provide additional power amplifier heat dissipation capability. The power amplifier/power control boards are mounted separate from the exciter which permits the use of a larger heat sink.

Should the temperature rise excessively in an intermittent duty station, transmitter output

power is automatically cut back to keep transistor temperature within the safe operating range. This feature is not required or provided with continuous duty stations.

In intermittent duty stations, a single, integral transmitter assembly occupies one "shelf" of the station. These transmitters consist of exciter, power amplifier, power control board and all necessary associated items. Continuous duty stations use a transmitter that consists of two separate assemblies; the exciter-driver and power amplifier are separate assemblies, each occupying a "shelf" of the station.

Transmitter cabling is detailed in the rf intercabling section at the rear of this manual under station diagrams. Electrical parts list information accompanies the applicable schematic diagram. Transmitter mechanical items are parts listed in the transmitter hardware kits section under the transmitter miscellaneous tabs.



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

MOTOROLA

MODEL CHART
FOR
INTERMITTENT DUTY
POWER AMPLIFIER
SECOND VERSION

CODE:

☒ = ONE ITEM INCLUDED.

NOTE

THESE POWER AMPLIFIERS ARE PART OF INTERMITTENT DUTY STATION MODELS LISTED IN THE TRANSMITTER MODEL CHART.

MODEL		DESCRIPTION		ITEM	DESCRIPTION	
		90/110 W POWER AMPLIFIER				
TLD1682B	132-150.8 MHz				TLD5952A	100 W POWER AMPLIFIER BOARD (132-150.8 MHz)
TLD1683C	150.8-162 MHz				TLD5953A	100 W POWER AMPLIFIER BOARD (150.8-162 MHz)
TLD1684C	162-174 MHz				TLD5954A	100 W POWER AMPLIFIER BOARD (162-174 MHz)
		60 W POWER AMPLIFIER			TFD6111A	EXCITER FILTER (132-150.8 MHz)
TLD1673A	150.8-162 MHz				TFD6112A	EXCITER FILTER (150.8-174 MHz)
TLD1674A	162-174 MHz				TFD6101A	HARMONIC FILTER (132-150.8 MHz)
					TFD6102A	HARMONIC FILTER (150.8-174 MHz)
					TLN5605A	CHASSIS & HEAT SINK ASSEMBLY, 100 W
					TLN5074A	TERMINAL BRACKET
					TLD8313A	60 W POWER AMPLIFIER BOARD (150.8-162 MHz)
					TLD8314A	60 W POWER AMPLIFIER BOARD (162-174 MHz)
					TLN4781A	CHASSIS & HEAT SINK ASSEMBLY, 60 W
					TRN6444A	R-C REGEN SUPPRESSOR KIT (60 W)
					TRN6445A	R-C REGEN SUPPRESSOR KIT (90-110 W, 132-162 MHz)
					TLD5502A	R-C REGEN SUPPRESSOR KIT (90-110 W, 162-174 MHz)
					TRN8069A	R-C REGEN SUPPRESSOR KIT (90-110 W)

EPS-26781-O

MOTOROLA

INTERMITTENT DUTY

POWER AMPLIFIER

MODEL CHART

132-174 MHz

CODE:

X = ONE ITEM INCLUDED.

NOTE

THESE POWER AMPLIFIERS ARE PART OF INTERMITTENT DUTY STATION MODELS LISTED IN THE TRANSMITTER MODEL CHART.

[illegible]

EPS-8817-C

MOTOROLA

MODEL CHART

FOR

CONTINUOUS DUTY

POWER AMPLIFIER

MODEL BREAKDOWN CHART

CODE:

X = ONE INCLUDED

[illegible]

EPS-26756-O

MOTOROLA

MODEL CHART

FOR

CONTINUOUS DUTY

POWER AMPLIFIER

MODEL BREAKDOWN CHART

CODE:

X = ONE INCLUDED

MOTOROLA					
MODEL CHART FOR CONTINUOUS DUTY POWER AMPLIFIER MODEL BREAKDOWN CHART					
		CODE:	X = ONE INCLUDED		
MODEL	DESCRIPTION	UNIT	DESCRIPTION	UNIT	DESCRIPTION
TLD1692C	100 W POWER AMPLIFIER (132-150.8 MHz)	X	P	TLD8620A	POWER CONTROL BOARD 90/100/110 W
TLD1693D	100 W POWER AMPLIFIER (150.8-162 MHz)	X	C	TLD8610A	POWER CONTROL BOARD 60 W
TLD1694D	100 W POWER AMPLIFIER (162-174 MHz)	X	A	TLD8302A	100 W POWER AMPLIFIER BOARD (132-150.8 MHz)
TLD1703C	60 W POWER AMPLIFIER (150.8-162 MHz)	X	B	TLD5483A	100 W POWER AMPLIFIER BOARD (150.8-162 MHz)
TLD1704C	60 W POWER AMPLIFIER (162-174 MHz)	X	D	TLD5484A	100 W POWER AMPLIFIER BOARD (162-174 MHz)
				TFD6101A	HARMONIC FILTER (132-150.8 MHz)
				TFD6102A	HARMONIC FILTER (150.8-174 MHz)
				TLN4741A	100 W PA HARDWARE
				TLN4780A	PA CASTING & HARDWARE ASSEMBLY
				TRN8012A	INPUT BRACKET & CABLE
				TLD8313A	60 W POWER AMPLIFIER BOARD (150.8-162 MHz)
				TLD8314A	60 W POWER AMPLIFIER BOARD (162-174 MHz)
				TLN4742A	60 W PA HARDWARE
				TRN6444A	RESISTOR-CAPACITOR NETWORK (60 W)
				TRN6445A	RESISTOR-CAPACITOR NETWORK (90-110 W)
				TLD5502A	RESISTOR-CAPACITOR NETWORK (110 W)
				TRN8069A	RESISTOR-CAPACITOR NETWORK (110 W)

EPS-22905-C

MOTOROLA

TRANSMITTER MODEL CHART FOR

132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO
AND REPEATER STATIONS
FOURTH VERSION

CODE:

☒ = ONE INCLUDED

* = CONSISTS OF ITEMS LISTED IN THE FOLLOWING INTERMITTENT
DUTY POWER AMPLIFIER MODEL CHART.

NOTE

INTERMITTENT DUTY STATIONS INCLUDE A
SINGLE TRANSMITTER UNIT. CONTINUOUS
DUTY STATIONS INCLUDE SEPARATE EXCIT-
ER-DRIVER AND POWER AMPLIFIER UNITS.

<div>MOTOROLA</div>	
<div>TRANSMITTER</div>	
<div>MODEL CHART</div>	
<div>FOR</div>	
<div>132-174 MHz</div>	
<div>"MICOR" "COMPA-STATION" BASE RADIO</div>	
<div>AND REPEATER STATIONS</div>	
<div>FOURTH VERSION</div>	
<div>CODE:</div>	
<div><div>X</div> = ONE INCLUDED</div>	
<div>* = CONSISTS OF ITEMS LISTED IN THE FOLLOWING INTERMITTENT DUTY POWER AMPLIFIER MODEL CHART.</div>	
<div>NOTE</div>	
<div>INTERMITTENT DUTY STATIONS INCLUDE A SINGLE TRANSMITTER UNIT. CONTINUOUS DUTY STATIONS INCLUDE SEPARATE EXCITER-DRIVER AND POWER AMPLIFIER UNITS.</div>	
<div>DESCRIPTION</div>	
<div>INTERMITTENT DUTY MODELS</div>	
<div>90/110 W POWER AMPLIFIER (132-150.8 MHz)</div>	
<div>90/110 W POWER AMPLIFIER (150.8-162 MHz)</div>	
<div>90/110 W POWER AMPLIFIER (162-174 MHz)</div>	
<div>60 W POWER AMPLIFIER (150.8-162 MHz)</div>	
<div>60 W POWER AMPLIFIER (162-174 MHz)</div>	
<div>TRANSMITTER INTERCONNECT BOARD</div>	
<div>TRANSMITTER RF CABLE ASSEMBLY</div>	
<div>TRANSMITTER HARDWARE</div>	
<div>INTERMITTENT & CONTINUOUS DUTY MODELS</div>	
<div>EXCITER BOARD (132-150.8 MHz)</div>	
<div>EXCITER BOARD (150.8-174 MHz)</div>	
<div>POWER CONTROL BOARD 90/100/110 W</div>	
<div>POWER CONTROL BOARD 60 W</div>	
<div>CONTINUOUS DUTY MODELS</div>	
<div>EXCITER FILTER (132-150.8)</div>	
<div>EXCITER FILTER (150.8-174)</div>	
<div>TRANSMITTER INTERCONNECT BOARD</div>	
<div>EXCITER CHASSIS & HARDWARE ASSEMBLY</div>	
<div>EXCITER RF CABLE</div>	
<div>100 W POWER AMPLIFIER BOARD (132-150.8 MHz)</div>	
<div>100 W POWER AMPLIFIER BOARD (150.8-162 MHz)</div>	
<div>100 W POWER AMPLIFIER BOARD (162-174 MHz)</div>	
<div>HARMONIC FILTER (132-150.8 MHz)</div>	
<div>HARMONIC FILTER (150.8-174 MHz)</div>	
<div>100 W PA HARDWARE</div>	
<div>PA CASTING & HARDWARE ASSEMBLY</div>	
<div>60 W POWER AMPLIFIER BOARD (150.8-162 MHz)</div>	
<div>60 W POWER AMPLIFIER BOARD (162-174 MHz)</div>	
<div>60 W PA HARDWARE</div>	
<div>R-C REGEN SUPPRESSOR KIT (110 W, 132-162 MHz)</div>	
<div>R-C REGEN SUPPRESSOR KIT (110 W, 162-174 MHz)</div>	
<div>R-C REGEN SUPPRESSOR KIT (60 W)</div>	
<div>POWER CONTROL BOARD 110 W 132-174 MHz</div>	
<div>INPUT BRACKET AND CABLE ASSEMBLY</div>	
<div>R-C REGEN SUPPRESSOR KIT (90-110 W)</div>	
<div>UNIT</div>	
<div>MODEL</div>	
<div>DESCRIPTION</div>	
<div>INTERMITTENT DUTY MODELS</div>	
<div>TTD1692CA 90/110 W TRANSMITTER (132-150.8 MHz)</div>	
<div>TTD1693DA 90/110 W TRANSMITTER (150.8-162 MHz)</div>	
<div>TTD1694DA 90/110 W TRANSMITTER (162-174 MHz)</div>	
<div>TTD1703BA 60 W TRANSMITTER (150.8-162 MHz)</div>	
<div>TTD1704BA 60 W TRANSMITTER (162-174 MHz)</div>	
<div>CONTINUOUS DUTY MODELS</div>	
<div>TLD1711B EXCITER-DRIVER (132-150.8 MHz)</div>	
<div>TLD1712B EXCITER-DRIVER (150.8-174 MHz)</div>	
<div>TLD1432D 100 W POWER AMPLIFIER (132-150.8 MHz)</div>	
<div>TLD1693E 100 W POWER AMPLIFIER (150.8-162 MHz)</div>	
<div>TLD1694E 100 W POWER AMPLIFIER (162-174 MHz)</div>	
<div>TLD1703C 60 W POWER AMPLIFIER (150.8-162 MHz)</div>	
<div>TLD1704C 60 W POWER AMPLIFIER (162-174 MHz)</div>	

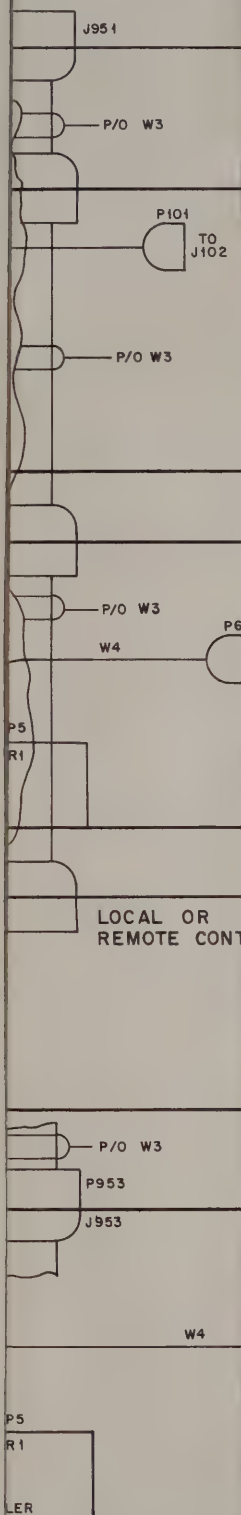
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ONS

RF INTERCABLING

"MICOR" "COMPA-STATION"

INTERMITTENT DUTY STATIONS



ONS IN TWO-RECEIVER STAT
EIVEIR NO.1 RF CONNECTION
FREQUENCIES AND OPTION
RECEIVER.
TWO OUTPUTS OF COUPLE

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Division

service publications
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MOTOROLA

TRANSMITTER MODEL CHART FOR 132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO
AND REPEATER STATIONS
FOURTH VERSION

CODE:

☒ = ONE INCLUDED

* - CONSISTS OF ITEMS LISTED IN THE FOLLOWING INTERMITTENT
DUTY POWER AMPLIFIER MODEL CHART.

NOTE

INTERMITTENT DUTY STATIONS INCLUDE A
SINGLE TRANSMITTER UNIT. CONTINUOUS
DUTY STATIONS INCLUDE SEPARATE EXCIT-
ER-DRIVER AND POWER AMPLIFIER UNITS.

DESCRIPTION

UNIT

INTERMITTENT DUTY MODELS

90/110 W POWER AMPLIFIER (132-150.8 MHz)
90/110 W POWER AMPLIFIER (150.8-162 MHz)
90/110 W POWER AMPLIFIER (162-174 MHz)
60 W POWER AMPLIFIER (150.8-162 MHz)
60 W POWER AMPLIFIER (162-174 MHz)
TRANSMITTER INTERCONNECT BOARD
TRANSMITTER RF CABLE ASSEMBLY
TRANSMITTER HARDWARE
INTERMITTENT & CONTINUOUS DUTY MODELS
EXCITER BOARD (132-150.8 MHz)
EXCITER BOARD (150.8-174 MHz)
POWER CONTROL BOARD 90/100/110 W
POWER CONTROL BOARD 60 W

CONTINUOUS DUTY MODELS

EXCITER FILTER (132-150.8 MHz)
EXCITER FILTER (150.8-174 MHz)
TRANSMITTER INTERCONNECT BOARD
EXCITER CHASSIS & HARDWARE ASSEMBLY
EXCITER RF CABLE
EXCITER REPEATER AMPLIFIER BOARD (132-150.8 MHz)
100 W POWER AMPLIFIER BOARD (150.8-162 MHz)
100 W POWER AMPLIFIER BOARD (162-174 MHz)
HARMONIC FILTER (132-150.8 MHz)
HARMONIC FILTER (150.8-174 MHz)
100 W PA HARDWARE
PA CASTING & HARDWARE ASSEMBLY

60 W POWER AMPLIFIER BOARD (150.8-162 MHz)
60 W POWER AMPLIFIER BOARD (162-174 MHz)
60 W REGEN SUPPRESSOR KIT (110 W, 132-162 MHz)
R-G REGEN SUPPRESSOR KIT (110 W, 162-174 MHz)
R-G REGEN SUPPRESSOR KIT (60 W)
POWER CONTROL BOARD 110 W 132-174 MHz
INPUT BRACKET AND CABLE ASSEMBLY
R-G REGEN SUPPRESSOR KIT (90-110 W)

MODEL

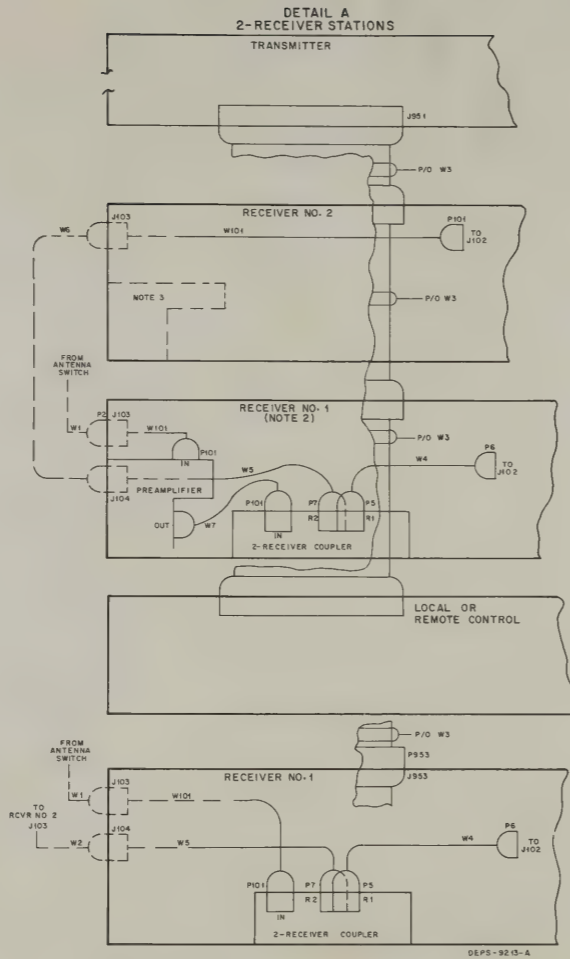
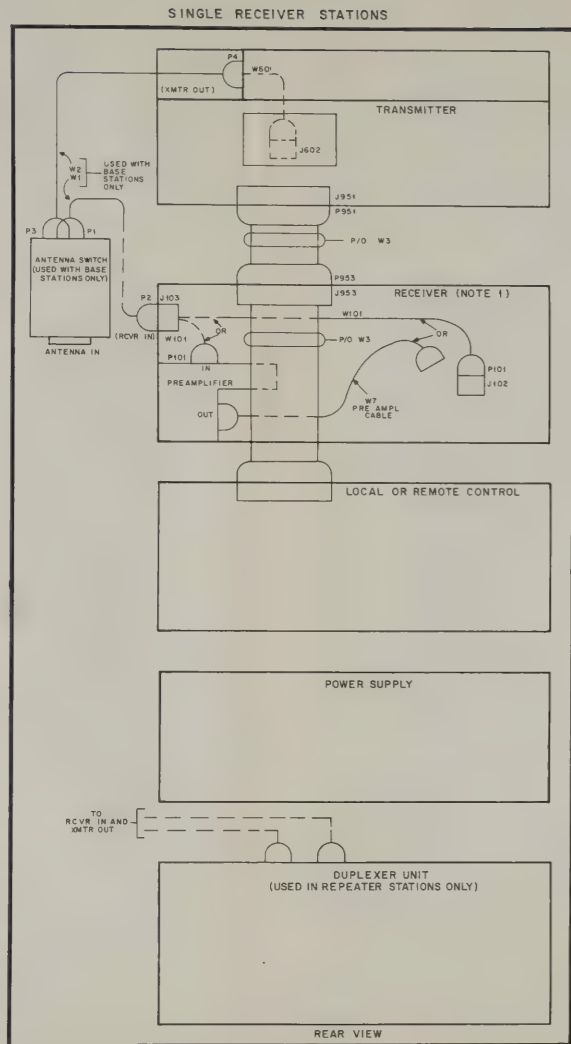
DESCRIPTION

INTERMITTENT DUTY MODELS

TTD1692CA 90/110 W TRANSMITTER (132-150.8 MHz)
TTD1693DA 90/110 W TRANSMITTER (150.8-162 MHz)
TTD1694DA 90/110 W TRANSMITTER (162-174 MHz)
TTD1703BA 60 W TRANSMITTER (150.8-162 MHz)
TTD1704BA 60 W TRANSMITTER (162-174 MHz)

CONTINUOUS DUTY MODELS

TLD1711B EXCITER-DRIVER (132-150.8 MHz)
TLD1712B EXCITER-DRIVER (150.8-174 MHz)
TLD1692D 100 W POWER AMPLIFIER (132-150.8 MHz)
TLD1693E 100 W POWER AMPLIFIER (150.8-162 MHz)
TLD1694E 100 W POWER AMPLIFIER (162-174 MHz)
TLD1703C 60 W POWER AMPLIFIER (150.8-162 MHz)
TLD1704C 60 W POWER AMPLIFIER (162-174 MHz)



- NOTES:
1. REFER TO DETAIL A FOR RECEIVER RF CONNECTIONS IN TWO-RECEIVER STATIONS.
 2. REFER TO WITHOUT PREAMPLIFIER DETAIL FOR RECEIVER NO.1 RF CONNECTIONS IF PREAMPLIFIER IS NOT USED.
 3. TWO-RECEIVER STATIONS WITH WIDELY SEPARATED FREQUENCIES AND OPTIONAL PREAMPLIFIER USE A PREAMPLIFIER WITH EACH RECEIVER. ANTENNA CONNECTS TO TWO-RECEIVER COUPLER. TWO OUTPUTS OF COUPLER CONNECTS TO PREAMPLIFIERS.

MOTOROLA		RF CABLE REQUIREMENTS	
		FOR	
		INTERMITTENT DUTY STATIONS	
		(132-174 MHz)	
STATION DESCRIPTION	REF. DESIG.	RF CABLE DESCRIPTION	PART #
BASE STATION - 1 RECEIVER	1	1V807388B	1V807388B
BASE STATION - 1 RECEIVER WITH OPTIONAL PREAMPLIFIER (TLD8421B OR TLD8422B)	2	1V807388B	1V807388B
BASE STATION - 2 RECEIVERS WITH 2-RECEIVER COUPLER (TLW758A)	3	1V807388B	1V807388B
BASE STATION - 2 RECEIVERS WITH 2-RECEIVER COUPLER (TLW758A) AND OPTIONAL PREAMPLIFIER (TLD8421B OR TLD8422B)	4	1V807388B	1V807388B
REPEATER STATION	5	1V807388B	1V807388B
	6	1V807388B	1V807388B
	7	1V807388B	1V807388B
	8	1V807388B	1V807388B
	9	1V807388B	1V807388B
	10	1V807388B	1V807388B
	11	1V807388B	1V807388B
	12	1V807388B	1V807388B
	13	1V807388B	1V807388B
	14	1V807388B	1V807388B
	15	1V807388B	1V807388B
	16	1V807388B	1V807388B
	17	1V807388B	1V807388B
	18	1V807388B	1V807388B
	19	1V807388B	1V807388B
	20	1V807388B	1V807388B
	21	1V807388B	1V807388B
	22	1V807388B	1V807388B
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	90	1V807388B	1V807388B
	91	1V807388B	1V807388B
	92	1V807388B	1V807388B
	93	1V807388B	1V807388B
	94	1V807388B	1V807388B
	95	1V807388B	1V807388B
	96	1V807388B	1V807388B
	97	1V807388B	1V807388B
	98	1V807388B	1V807388B
	99	1V807388B	1V807388B
	100	1V807388B	1V807388B

EPS-9214-B

RF INTERCABLING "MICOR" "COMPA-STATION"

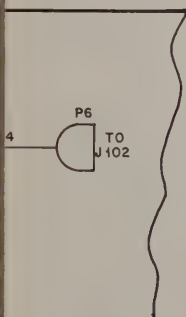
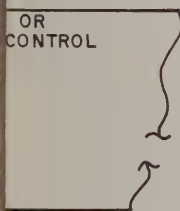
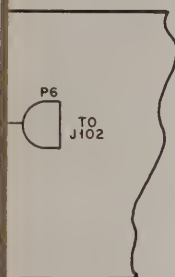
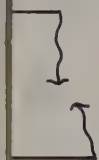
INTERMITTENT DUTY STATIONS

PARTS LIST SHOWN ON
BACK OF THIS SHEET

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service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

RF INTERCABLING "MICOR" "COMPA-STATION" CONTINUOUS DUTY STATIONS



WITH PREAMPLIFIER

WITHOUT PREAMPLIFIER

Preamplifier listed in manual of this

part of Duplexer which Two-Receiver manual.

part of Hardware Kit. Hardware manual for re-

DEPS-9215-B

PS-9314-O

A INC.
s Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

PARTS LIST SHOWN ON
BACK OF THIS SHEET

RF INTERCABLING - CONTINUOUS DUTY STATIONS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TKM6561A Intercable Kit		PL-1775-0
P1	28B82331G01	CONNECTOR, plug: single contact
P2	28B84967D01	BNC type
P3	28B82331G01	single contact
P4	28B84967D01	BNC type
W1	1V80728B48	CABLE ASSEMBLY: Includes: 30CB4173E01 CABLE, coaxial; 13" lg. rf. items P1 and P2
W2	1V80728B48	Includes: 30CB4173E01 CABLE, coaxial; 13" lg. ref. items P3 and P4
W3	1CB4592D02	Includes: 30CB4263D01 CABLE, flat 14BB4164E01 COVER, cable; 2 req'd. 14BB4409D01 COVER, cable; 2 req'd. 32BB4410D01 RUBBER FORCE MEMBER; 6 req'd. 42DB4431D02 CLAMP, female; 3 req'd. 42DB4431D01 CLAMP, male; 3 req'd.
NON-REFERENCED ITEMS		
	29C824151	LUG, terminal; 4 req'd.
	39510184A24	TERMINAL, contact; 2 req'd.
	29A82010D01	TERMINAL, contact; 2 req'd.
	78B4266D01	BRACKET, antenna relay

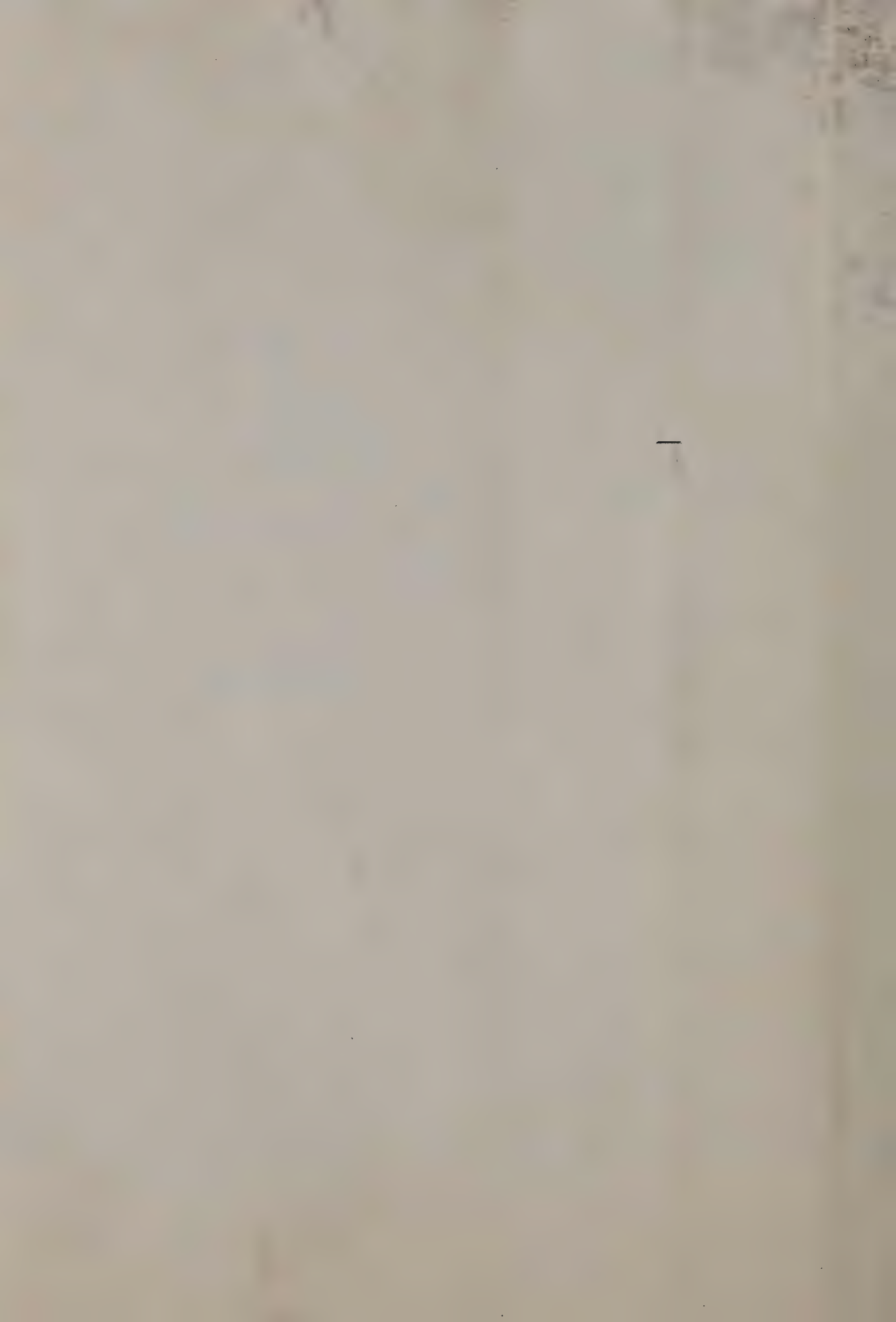
TKM6562A Intercable Kit		PL-1776-0
P1	28B82331G01	CONNECTOR, plug: single contact
P2	28B84967D01	BNC type
P3	28B82331G01	single contact
P4	28B84967D01	BNC type
W1	1V80728B48	CABLE ASSEMBLY: Includes: 30CB4173E01 CABLE, coaxial; 13" lg. ref. items P1 and P2
W2	-	Includes: 30CB4173E01 CABLE, coaxial; 17" lg. ref. items P3 and P4
W3	1CB4592D03	Includes: 30CB4263D01 CABLE, flat 14BB4164E01 COVER, cable; 2 req'd. 14BB4409D01 COVER, cable; 2 req'd. 32BB4410D01 RUBBER FORCE MEMBER; 8 req'd. 42DB4431D02 CLAMP, female; 4 req'd. 42DB4431D01 CLAMP, male; 4 req'd.
NON-REFERENCED ITEMS		
	39510184A24	TERMINAL, contact; 2 req'd.
	29A82010D01	TERMINAL, contact; 2 req'd.
	29C824151	LUG, terminal; 4 req'd.
	78B4266D01	BRACKET, anten. relay

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TKM6569A Transmitter RF Cable Kit		PL-1777-0
W601	TXM6569A	CABLE ASSEMBLY: Includes: 30B43794C01 CABLE, coaxial; 5" lg. 28A82365D03 CONNECTOR, plug; single contact 9AB4968D01 CONNECTOR, plug; BNC bulkhead type

TKM6570A Receiver RF Cable Kit		PL-1778-0
J103	9AB4968D01	CONNECTOR, plug: BNC bulkhead type
P101	28B82331G01	single contact
W101	TKM6570A	CABLE ASSEMBLY: Includes: 30B43794C01 CABLE, coaxial; 17" lg. ref. items J103 and P101

TKM6616A Intercable Kit		PL-1779-0
W3	1CB4592D02	CABLE ASSEMBLY: Includes: 30CB4263D01 CABLE, flat 14BB4164E01 COVER, cable; 2 req'd. 14BB4409D01 COVER, cable; 2 req'd. 32BB4410D01 RUBBER FORCE MEMBER; 6 req'd. 42DB4431D02 CLAMP, female; 3 req'd. 42DB4431D01 CLAMP, male; 3 req'd.
NON-REFERENCED ITEM		
	29C824151	LUG, terminal; 4 req'd.



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TKN6563A Station Interchange Kit

PL-1780-0

P1	28B82331G01	CONNECTOR, plug; single contact
P2	28B84967D01	BNC type
P3	28B82331G01	single contact
P4	28A84967D01	BNC type
W1	1V80728B48	CABLE ASSEMBLY: includes: 30C84173E01 CABLE, coaxial; 13" lg. ref. items P1 and P2
W2	1V80730B03	includes: 30C84173E01 CABLE, coaxial; 18" lg. ref. items P3 and P4
W3	1C084592D02	includes: 30C84063D01 CABLE, flat 14B84164E01 COVER, cable; 2 req'd. 14B84409D01 COVER, cable; 2 req'd. 32B84410D01 RUBBER FORCE MEMBER: 6 req'd. 42D84431D02 CLAMP, female; 3 req'd. 42D84431D01 CLAMP, male; 3 req'd.
W402	1V80730B26	includes: 30C84173E01 CABLE, coaxial; 21" lg. 28A84967D01 CONNECTOR, plug; BNC type; 2 req'd.
NON-REFERENCED ITEMS		
	29C824151	LUG, terminal; 4 req'd.
	29C82010D01	TERMINAL, contact; 2 req'd.
	39C10184A24	TERMINAL, contact; 2 req'd.
	98B4234E10	JACK, test; white

TKN6570A Receiver RF Cable Kit

PL-1778-0

P101	9A84968D01	CONNECTOR, plug; BNC bulkhead type
P101	28B82331G01	single contact
W101	TKN6570A	CABLE ASSEMBLY: includes: 30B83794C01 CABLE, coaxial; 17" lg. ref. items J103 and P101

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TKN6571A Station Interchange Kit

PL-1781-0

P1	28B82331G01	CONNECTOR, plug; single contact
P2	28A84967D01	BNC type
P3	28B82331G01	single contact
P4	28A84967D01	BNC type
W1	1V80728B48	CABLE ASSEMBLY: includes: 30C84173E01 CABLE, coaxial; 13" lg. ref. items P1 and P2
W2	1V80730B27	includes: 30C84173E01 CABLE, coaxial; 23" lg. ref. items P3 and P4
W3	1C084592D03	includes: 30C84063D01 CABLE, flat 14B84164E01 COVER, cable; 2 req'd. 14B84409D01 COVER, cable; 2 req'd. 32B84410D01 RUBBER FORCE MEMBER: 8 req'd. 42D84431D02 CLAMP, female; 4 req'd. 42D84431D01 CLAMP, male; 4 req'd.
W402	1V80730B26	includes: 30C84173E01 CABLE, coaxial; 21" lg. 28A84967D01 CONNECTOR, plug; BNC type; 2 req'd.
NON-REFERENCED ITEMS		
	29C824151	LUG, terminal; 4 req'd.
	39C10184A24	TERMINAL, contact; 2 req'd.
	79C82010D01	TERMINAL, contact; 2 req'd.
	98B4234E10	JACK, test; white

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TKN6581A Exciter RF Cable Kit

PL-1782-A

W401	TKN6581A	CABLE ASSEMBLY: includes: 30B83794C01 CABLE, coaxial; 8" lg. 9A84968D01 CONNECTOR, plug; BNC bulkhead type 28B82331G01 CONNECTOR, plug; single contact
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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TKN6617A Interchange Kit

PL-1783-0

W3	1C084592D02	CABLE ASSEMBLY: includes: 30C84263D01 CABLE, flat 14B84164E01 COVER, cable; 2 req'd. 14B84409D01 COVER, cable; 2 req'd. 32B84410D01 RUBBER FORCE MEMBER: 6 req'd. 42D84431D02 CLAMP, female; 3 req'd. 42D84431D01 CLAMP, male; 3 req'd.
W402	1V80730B26	includes: 30C84173E01 CABLE, coaxial; 21" lg. 28A84967D01 CONNECTOR, plug; BNC type; 2 req'd.
NON-REFERENCED ITEMS		
	29C824151	LUG, terminal; 4 req'd.
	29C82010D01	TERMINAL, contact
	98B4234E10	JACK, test; white

W501 & W601 Cable Assemblies

PL-1825-0

W501	1V80727B92	CABLE ASSEMBLY: includes: 30B83794C01 CABLE, coaxial; 8" lg. 9A84968D01 CONNECTOR, plug; BNC bulkhead type
W601	1V80727B96	includes: 30C82921H01 CABLE, coaxial; 8" lg. 28A82365D03 CONNECTOR, plug; single contact, right angle 9A844509 CONNECTOR, plug; BNC type

MOTOROLA

TRANSMITTER

MODEL CHART

FOR

132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO

AND REPEATER STATIONS

THIRD VERSION

CODE:

☒ = ONE INCLUDED

* = CONSISTS OF ITEMS LISTED IN THE FOLLOWING INTERMITTENT DUTY POWER AMPLIFIER MODEL CHART.

NOTE

INTERMITTENT DUTY STATIONS INCLUDE A SINGLE TRANSMITTER UNIT. CONTINUOUS DUTY STATIONS INCLUDE SEPARATE EXCITER-DRIVER AND POWER AMPLIFIER UNITS.

<div>MOTOROLA</div>		<div>TRANSMITTER</div> <div>MODEL CHART</div> <div>FOR</div> <div>132-174 MHz</div> <div>"MICOR" "COMPA-STATION" BASE RADIO</div> <div>AND REPEATER STATIONS</div> <div>THIRD VERSION</div>	
<div>CODE:</div> <div><div>X</div> = ONE INCLUDED</div> <div>* = CONSISTS OF ITEMS LISTED IN THE FOLLOWING INTERMITTENT DUTY POWER AMPLIFIER MODEL CHART.</div>		<div>DESCRIPTION</div> <div>INTERMITTENT DUTY MODELS</div> <div>90/110 W POWER AMPLIFIER (132-150.8 MHz)</div> <div>90/110 W POWER AMPLIFIER (150.8-162 MHz)</div> <div>90/110 W POWER AMPLIFIER (162-174 MHz)</div> <div>60 W POWER AMPLIFIER (150.8-162 MHz)</div> <div>60 W POWER AMPLIFIER (162-174 MHz)</div> <div>TRANSMITTER INTERCONNECT BOARD</div> <div>TRANSMITTER RF CABLE ASSEMBLY</div> <div>TRANSMITTER HARDWARE</div> <div>INTERMITTENT & CONTINUOUS DUTY MODELS</div> <div>EXCITER BOARD (132-150.8 MHz)</div> <div>EXCITER BOARD (150.8-174 MHz)</div> <div>POWER CONTROL BOARD 90/100/110 W</div> <div>POWER CONTROL BOARD 60 W</div> <div>CONTINUOUS DUTY MODELS</div> <div>EXCITER FILTER (132-150.8)</div> <div>EXCITER FILTER (150.8-174)</div> <div>TRANSMITTER INTERCONNECT BOARD</div> <div>EXCITER CHASSIS & HARDWARE ASSEMBLY</div> <div>EXCITER RF CABLE</div> <div>100 W POWER AMPLIFIER BOARD (132-150.8 MHz)</div> <div>100 W POWER AMPLIFIER BOARD (150.8-162 MHz)</div> <div>100 W POWER AMPLIFIER BOARD (162-174 MHz)</div> <div>HARMONIC FILTER (132-150.8 MHz)</div> <div>HARMONIC FILTER (150.8-174 MHz)</div> <div>100 W PA HARDWARE</div> <div>PA CASTING & HARDWARE ASSEMBLY</div> <div>INPUT BRACKET & CABLE</div> <div>60 W POWER AMPLIFIER BOARD (150.8-162 MHz)</div> <div>60 W POWER AMPLIFIER BOARD (162-174 MHz)</div> <div>60 W PA HARDWARE</div> <div>R-C REGEN SUPPRESSOR KIT (110 W, 132-162 MHz)</div> <div>R-C REGEN SUPPRESSOR KIT (110 W, 162-174 MHz)</div> <div>R-C REGEN SUPPRESSOR KIT (60 W)</div>	
MODEL	DESCRIPTION	UNIT	
INTERMITTENT DUTY MODELS			
TTD1692BA	90/110 W TRANSMITTER (132-150.8 MHz)	*TLD1682A	X
TTD1693CA	90/110 W TRANSMITTER (150.8-162 MHz)	*TLD1683B	X
TTD1694CA	90/110 W TRANSMITTER (162-174 MHz)	*TLD1684B	X
TTD1703BA	60 W TRANSMITTER (150.8-162 MHz)	*TLD1673A	X
TTD1704BA	60 W TRANSMITTER (162-174 MHz)	*TLD1674A	X
CONTINUOUS DUTY MODELS			
TLD1711B	EXCITER-DRIVER (132-150.8 MHz)	TLN4729B	X
TLD1712B	EXCITER-DRIVER (150.8-174 MHz)	TKN6569A	X
TLD1692B	100 W POWER AMPLIFIER (132-150.8 MHz)	TLN4730A	X
TLD1693C	100 W POWER AMPLIFIER (150.8-162 MHz)	TLD5321A	X
TLD1694C	100 W POWER AMPLIFIER (162-174 MHz)	TLD4322A	X
TLD1703B	60 W POWER AMPLIFIER (150.8-162 MHz)	TLD8620A	X
TLD1704B	60 W POWER AMPLIFIER (162-174 MHz)	TLD8610A	X

MOTOROLA

TRANSMITTER

MODEL CHART

FOR

132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO

AND REPEATER STATIONS

SECOND VERSION

CODE:

☒ = ONE INCLUDED

■ = CONSISTS OF ITEMS LISTED IN THE FOLLOWING
INTERMITTENT DUTY POWER AMPLIFIER MODEL
CHART.

NOTE

INTERMITTENT DUTY STATIONS INCLUDE A SINGLE
TRANSMITTER UNIT. CONTINUOUS DUTY STATIONS
INCLUDE SEPARATE EXCITER-DRIVER AND POWER
AMPLIFIER UNITS.

MODEL		DESCRIPTION		UNIT	DESCRIPTION
		INTERMITTENT DUTY MODELS			INTERMITTENT DUTY MODELS
TTD1692BA	90/110W TRANSMITTER (132-150.8 MHz)	☒		*TLD1682A	90/110W POWER AMPLIFIER (132-150.8 MHz)
TTD1693BA	90/110W TRANSMITTER (150.8-162 MHz)		☒	*TLD1683A	90/110W POWER AMPLIFIER (150.8-162 MHz)
TTD1694BA	90/110W TRANSMITTER (162-174 MHz)		☒	*TLD1684A	90/110W POWER AMPLIFIER (162-174 MHz)
TTD1703BA	60W TRANSMITTER (150.8-162 MHz)		☒	*TLD1673A	60W POWER AMPLIFIER (150.8-162 MHz)
TTD1704BA	60W TRANSMITTER (162-174 MHz)		☒	*TLD1674A	60W POWER AMPLIFIER (162-174 MHz)
			☒	TLN4729B	TRANSMITTER INTERCONNECT BOARD
			☒	TKN6569A	TRANSMITTER RF CABLE ASSEMBLY
			☒	TLN4730A	TRANSMITTER HARDWARE
			☒	TLD5321A	INTERMITTENT & CONTINUOUS DUTY MODELS EXCITER BOARD (132-150.8 MHz)
			☒	TLD5322A	EXCITER BOARD (150.8-174 MHz)
			☒	TLD8620A	POWER CONTROL BOARD 90/100/110W
			☒	TLD8610A	POWER CONTROL BOARD 60W
		CONTINUOUS DUTY MODELS			CONTINUOUS DUTY MODELS
TLD1711B	EXCITER-DRIVER (132-150.8 MHz)	☒	☒	TFD6111A	EXCITER FILTER (132-150.8 MHz)
TLD1712B	EXCITER-DRIVER (150.8-174 MHz)		☒	TFD6112A	EXCITER FILTER (150.8-174 MHz)
TLD1692A	100W POWER AMPLIFIER (132-150.8 MHz)		☒	TLN4743B	TRANSMITTER INTERCONNECT BOARD
TLD1693B	100W POWER AMPLIFIER (150.8-162 MHz) FORMERLY TLD1693A		☒	TLN4744A	EXCITER CHASSIS & HARDWARE ASSEMBLY
TLD1694B	100W POWER AMPLIFIER (162-174 MHz) FORMERLY TLD1694A		☒	TKN6581A	EXCITER RF CABLE
TLD1703A	60W POWER AMPLIFIER (150.8-162 MHz)		☒	TLD8302A	100W POWER AMPLIFIER BOARD (132-150.8 MHz)
TLD1704A	60W POWER AMPLIFIER (162-174 MHz)		☒	TLD5483A	100W POWER AMPLIFIER BOARD (150.8-162 MHz) FORMERLY TLD8633A
			☒	TLD5484A	100W POWER AMPLIFIER BOARD (162-174 MHz) FORMERLY TLD8624A
			☒	TFD6101A	HARMONIC FILTER (132-150.8 MHz)
			☒	TFD6102A	HARMONIC FILTER (150.8-174 MHz)
			☒	TLN4741A	100W PA HARDWARE
			☒	TLN4780A	PA CASTING & HARDWARE ASSEMBLY
			☒	TLN4822A	INPUT BRACKET & CABLE
			☒	TLD8313A	60W POWER AMPLIFIER BOARD (150.8-162 MHz)
			☒	TLD8314A	60W POWER AMPLIFIER BOARD (162-174 MHz)
			☒	TLN4742A	60W PA HARDWARE
			☒	TLD5502A	R-C REGEN SUPPRESSOR KIT (10 W, 162-174 MHz)
			☒	TLD6444A	R-C REGEN SUPPRESSOR KIT (60 W)
			☒	TLD6445A	R-C REGEN SUPPRESSOR KIT (110 W, 132-162 MHz)

TRANSMITTER
MODEL CHART
FOR
132-174 MHz
MOTOROLA "COMPA-STATION" BASE RADIO
AND REPEATER STATIONS
ORIGINAL VERSION

[X] = ONE INCLUDED

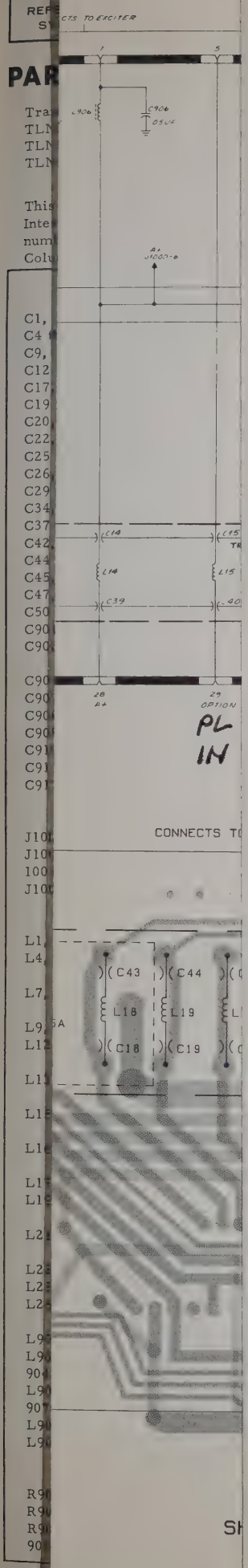
* = CONSISTS OF ITEMS LISTED IN THE

INTERMITTENT DUTY POWER AMPLIFIER MODEL
CHART.

NOTE

INTERMITTENT DUTY STATIONS INCLUDE A SINGLE TRANSMITTER UNIT. CONTINUOUS DUTY STATIONS INCLUDE SEPARATE EXCITER-DRIVER AND POWER AMPLIFIER UNITS.

EPS-8816-B



TRANSMITTER INTERCONNECT BOARD

MODEL TLN5894A (RPTR)
MODEL TLN5893A (BASE)
MODEL TLN5895A (FULL FILTERING OPTION)

FUNCTION -

--Interconnects most transmitter circuit boards to each other (except PA).

--Routes control functions from the unified chassis interconnect board to the transmitter.

--Repeater version includes unique transmitter filtering components.

--Includes partial control stage circuitry used to govern PA power output

--Includes current limiter stage (base stations only) which is electrically functional with antenna network.

TRANSMITTER INTERCONNECT BOARD

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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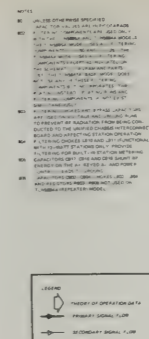
NON-REFERENCED ITEMS	
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9-83011H01
14-84966D01

39-10184A10	CONTACT
3 120405	200000

3-139495	SCREW, tapping: 6-20 x 5/16 4 used
7-82626K01	BRACKET, filter (TLN5893A)
14-82621K01	INSULATOR: 17.15 x .76" (TLN5893A)

14-83375K01	INSULATOR: 9.560 x .900"
42-83629G01	FASTENER, drive; 2 used
1-80775B75	COVER ASSEMBLY, filter (TLN5894A & TLN5895A) includes: COVER, filter BRACKET ASSEMBLY, filter (TLN5894A) includes: BRACKET, filter CAPACITORS C4-8, C12-16, C20, C21, C25, C29-33, C37-41, C45, C46, C50 CIRCUIT BOARD ASSEMBL (TLN5894A & TLN5895A) includes: CONTACT, female; 49 used INSULATOR: .760 x .240"; 8 used CONTACT, male; 3 used SCREW, tapping; 4-40 x 3/8"; 6 used (TLN5894A & TLN5895A) RETAINER, screw; 5 used (TLN5894A & TLN5895A) BRACKET ASSEMBLY, filter (TLN5895A) includes: BRACKET, filter CAPACITORS C4-25, C29-50
15-82173K01	
1-80793B13	
7-82626K01	
1-80793B16	
9-83011H01	
14-84965D01	
39-10184A10	
3-138162	
42-84284B01	
1-80793B14	
7-82626K01	



MODEL TLN5894A (RPTR)
MODEL TLN5893A (BASE)
MODEL TLN5895A (FULL FILTERING OPTION)

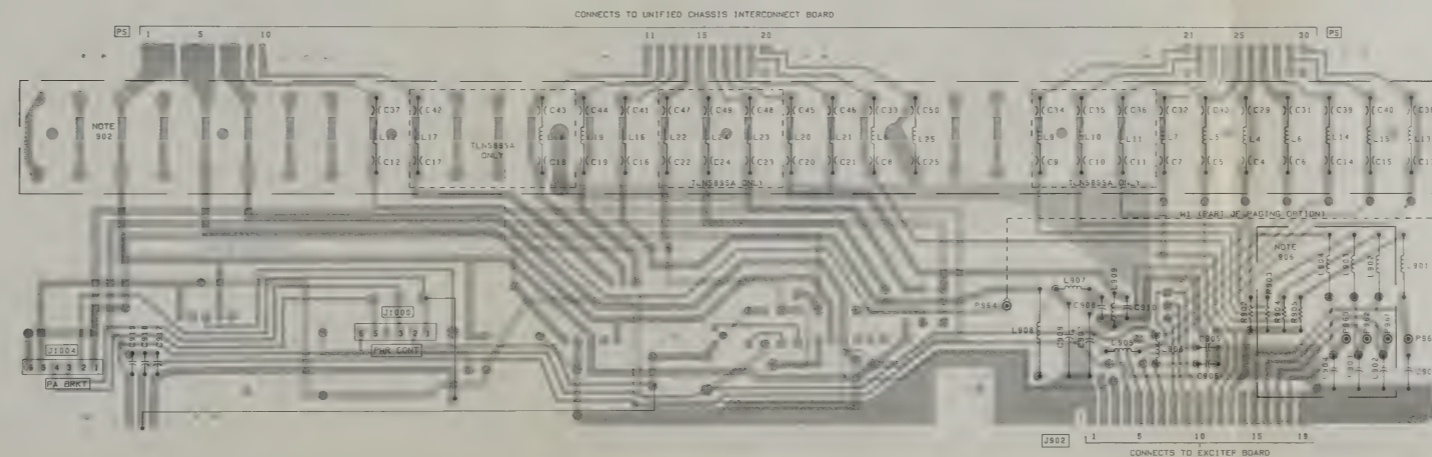
--Interconnects most transmitter circuit boards to each other (except PA).

--Routes control functions from the unified chassis interconnect board to the transmitter.

--Repeater version includes unique transmitter filtering components.

--Includes partial control stage circuitry
used to govern PA power output

--Includes current limiter stage (base stations only) which is electrically functional with antenna network.



SHOWN FROM SOLDER SIDE

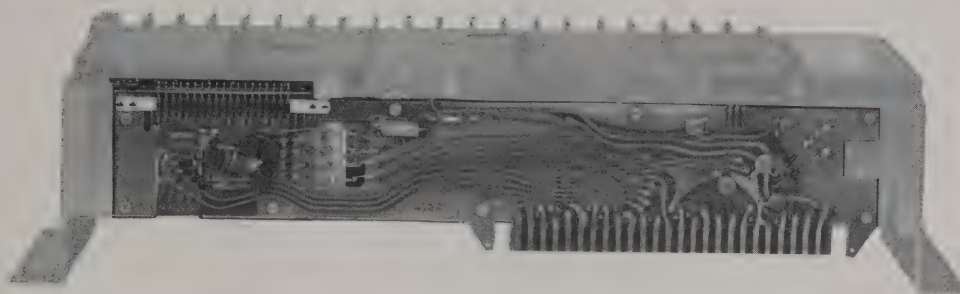
COMPONENT SIDE ■ BD-EEPS-22691-0
SOLDER SIDE ● BD-EEPS-22690-0
QL-EEPS-22692-A

TRANSMITTER INTERCONNECT BOARD

MODEL TLN4729B

EXCITER/DRIVER INTERCONNECT BOARD

MODEL TLN4743B



AEPS-8577-O

These interconnect boards connect most of the transmitter input and output functions to the station 50-conductor intercable. Two transmitter models are available:

--TLN4729B Transmitter Interconnect Board for all intermittent duty stations and all 72-76 MHz band continuous duty stations.

--TLN4743B Exciter/Driver Interconnect Board for all continuous duty stations except 72-76 MHz band continuous duty stations.

Two interconnect board models are available to permit two station transmitter "rack up" arrangements. One puts the entire transmitter on one "shelf" in the station. This arrangement is used for all intermittent duty stations and for 72-76 MHz stations. The exciter and power control board plug directly into the interconnect board.

With the other station arrangement, the transmitter is divided into separate exciter/driver and power amplifier/power control "shelves". This allows additional power amplifier heatsink capability. In this arrangement,

only the exciter plugs directly into the interconnect board. The power control board picks up its A+, A-, and POWER CONTROL functions via separate wires from the power amplifier.

NOTE

72-76 MHz stations are continuous duty stations even though the transmitter occupies only one "shelf". RF output power is low enough so as not to require additional heat-sinking for continuous duty operation.

Filtering chokes, feedthru capacitors, and bypass capacitors are used on voltage and ground runs to prevent rf radiation from being conducted to the 50-conductor cable and affecting station operation. The feedthru capacitors are chassis mounted as indicated on the schematic diagram.

Filtering chokes L910 and L911 provide filtering for an optional built-in station metering kit. Capacitors C917, C918, and C919 are connected only on intermittent duty & 72-76 MHz stations. These capacitors shunt rf energy on the A+, KEYED A-, and POWER CONTROL leads to ground.

 **MOTOROLA INC.**
Communications Division

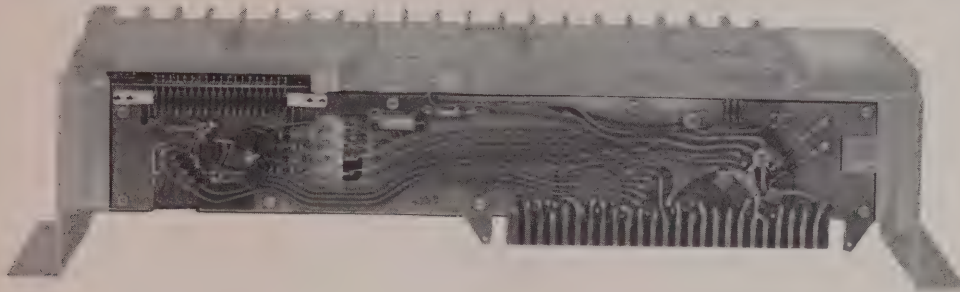
service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

TRANSMITTER INTERCONNECT BOARD

MODEL TLN4729B

EXCITER/DRIVER INTERCONNECT BOARD

MODEL TLN4743B



AEPS-8577-O

These interconnect boards connect most of the transmitter input and output functions to the station 50-conductor intercable. Two transmitter models are available:

--TLN4729B Transmitter Interconnect Board for all intermittent duty stations and all 72-76 MHz band continuous duty stations.

--TLN4743B Exciter/Driver Interconnect Board for all continuous duty stations except 72-76 MHz band continuous duty stations.

Two interconnect board models are available to permit two station transmitter "rack up" arrangements. One puts the entire transmitter on one "shelf" in the station. This arrangement is used for all intermittent duty stations and for 72-76 MHz stations. The exciter and power control board plug directly into the interconnect board.

With the other station arrangement, the transmitter is divided into separate exciter/driver and power amplifier/power control "shelves". This allows additional power amplifier heatsink capability. In this arrangement,

only the exciter plugs directly into the interconnect board. The power control board picks up its A+, A-, and POWER CONTROL functions via separate wires from the power amplifier.

NOTE

72-76 MHz stations are continuous duty stations even though the transmitter occupies only one "shelf". RF output power is low enough so as not to require additional heat-sinking for continuous duty operation.

Filtering chokes, feedthru capacitors, and bypass capacitors are used on voltage and ground runs to prevent rf radiation from being conducted to the 50-conductor cable and affecting station operation. The feedthru capacitors are chassis mounted as indicated on the schematic diagram.

Filtering chokes L910 and L911 provide filtering for an optional built-in station metering kit. Capacitors C917, C918, and C919 are connected only on intermittent duty & 72-76 MHz stations. These capacitors shunt rf energy on the A+, KEYED A-, and POWER CONTROL leads to ground.

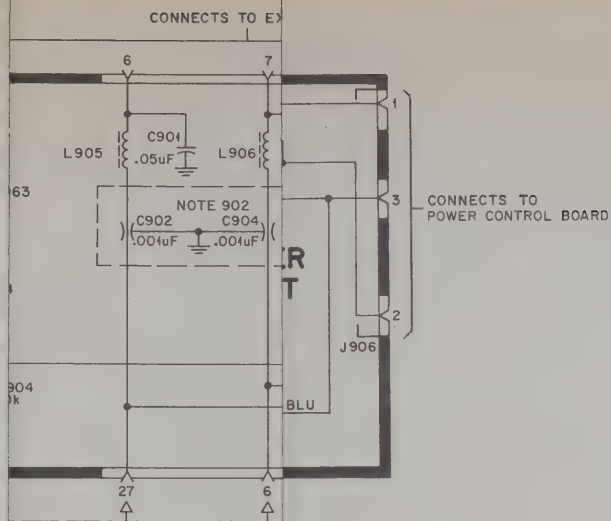
TRANSMITTER INTERCONNECT BOARD



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Communications Division

service publications

1301 E. Algonquin Road, Schaumburg, IL 60196

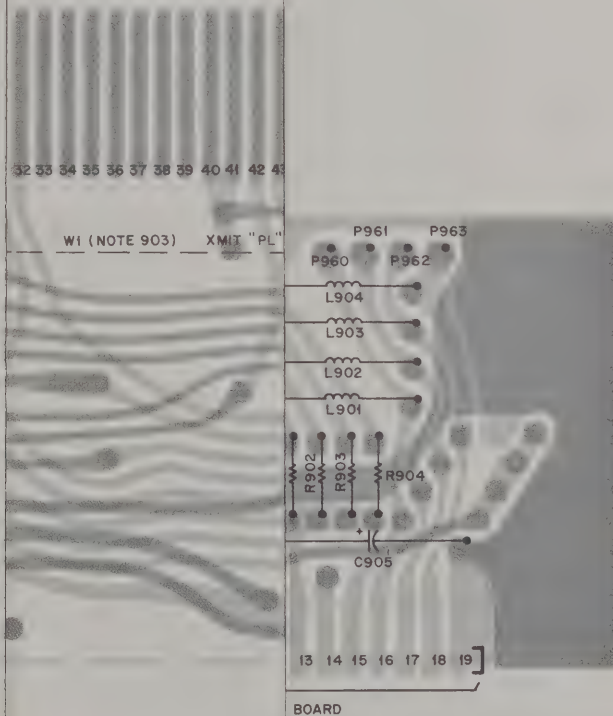


TER/DRIVER INTERCONNECT BOARD

UNLESS OTHERWISE SPECIFIED:
CAPACITOR VALUES ARE IN PICOFARADS.

C902, C904, C907, C911, AND C912 ARE
CHASSIS MOUNTED COMPONENTS AND ARE
NOT PART OF INTERCONNECT BOARD.

CABLE W1 IS STANDARD IN H.E.A.R.
STATIONS, PART OF PAGING OPTION IN
OTHER STATIONS.



729B Transmitter Interconnect Board
LN4743B Exciter/Driver Interconnect Board
Schematic Diagram and Circuit Board Detail
Control No. PEPS-16960-E
80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN4729B and TLN4743B

Exciter/Driver Interconnect Board

PL-3238-A

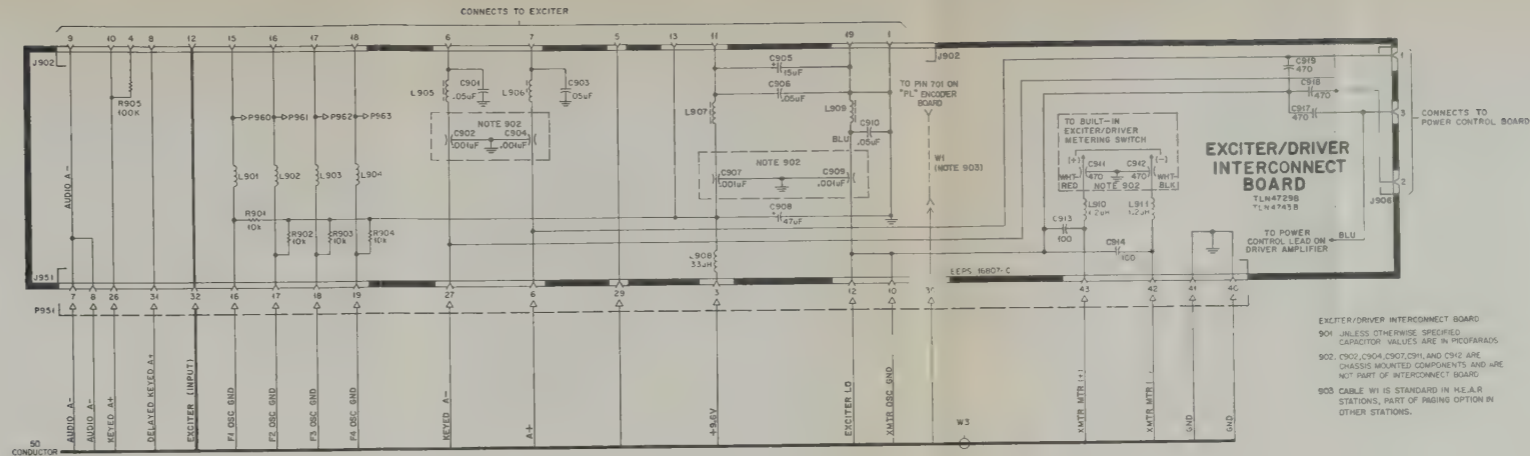
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C901	21-82372C04	CAPACITOR, fixed; .05 +80-20%; 25 V
C903	21-82372C04	.05 +80-20%; 25 V
C905	21-82372C04	.05 +80-20%; 25 V
C906	21-82372C04	.05 +80-20%; 25 V
C908	23-82783B31	47 +20%; 20 V
C910	21-82372C04	.05 +80-20%; 25 V
C913, 914	21-82204B06	100 pF ±10%; 500 V
C917, 918, 919	21-82187B07	470 pF ±10%; 500 V
L901 thru 904	24-80900A61	COIL, RF; 0.62 mH coded BRN
L905, 906, 907	24-83961B01	choke; 33 uH coded BRN
L908	24-854314	choke; 1.2 uH
L909	24-83961B01	choke; 1.2 uH
L910, 911	24-82723H01	choke; 1.2 uH
R901 thru 904	6-129225	RESISTOR, fixed; ±10%; 1/4 W; 10k
R905	6-129226	100k

TLN4728A/B Transmitter Chassis & Heat Sink Kit
 TLN4729A/B Exciter Chassis & Hardware Kit
 TLN4743A/B Transmitter Chassis & Heat Sink Kit
 TLN4744A Exciter Chassis & Hardware Kit
 TLN4745A Exciter Chassis & Hardware Kit
 TLN4757A Transmitter Chassis & Heat Sink Kit
 TLN4781A Transmitter Chassis & Heat Sink Kit
 TLN5150A Transmitter Chassis & Heat Sink Kit PL-1835-B

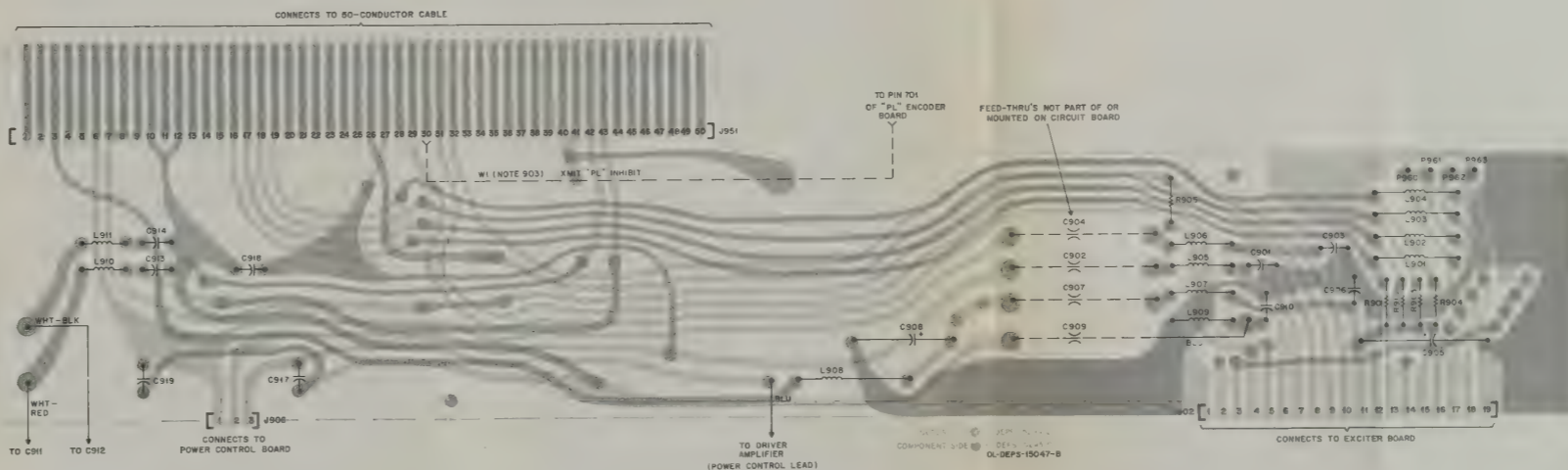
C902, 904, 907, 909	21-861219	CAPACITOR, fixed; .001 uF ±100-0%; 500 V
C911, 912	21-821474	470 pF ±20%; 500 V

NOTE:

Additional electrical components are listed in the Power Amplifier Section; hardware is listed in the Transmitter Hardware Kits Section.



EXCITER/DRIVER INTERCONNECT BOARD
 901 UNLESS OTHERWISE SPECIFIED.
 CAPACITOR VALUES ARE IN MICROFARADS.
 902, C902, C904, C907, C911, AND C912 ARE CHASSIS MOUNTED COMPONENTS AND ARE NOT PART OF INTERCONNECT BOARD.
 903 CABLE WH IS STANDARD IN H.E.A.R. STATIONS, PART OF PAGING OPTION IN OTHER STATIONS.



SHOWN FROM COMPONENT SIDE

TLN4729B Transmitter Interconnect Board and TLN4743B Exciter/Driver Interconnect Board Schematic Diagram and Circuit Board Detail Motorola No. PEPS-16960-E 6/20/80-PHI

MODEL	FREQUENCY
TLD5321A	132-150.8 MHz
TLD5322A	150.8-174 MHz

TECHNICAL CHARACTERISTICS

	MODEL TLD5321A	MODEL TLD5322A
FREQUENCY	132-150.8 MHz	150.8-174 MHz
NUMBER OF CHANNELS	1 to 4	
MAXIMUM FREQUENCY SEPARATION	±750 kHz	
OSCILLATOR FREQUENCY	11-14.5 MHz	
FREQUENCY MULTIPLICATION	12 times	
OUTPUT POWER	400 milliwatts	
OUTPUT IMPEDANCE	50 ohms	
MODULATOR TYPE	Direct FM	
DEVIATION	±5 kHz, adjustable instantaneous deviation limiting	
AUDIO RESPONSE	6 dB/octave pre-emphasis 300 to 3000 Hz	
AUDIO SENSITIVITY	165 millivolts for ±3.0 kHz deviation	
AUDIO DISTORTION	Less than 3% at ±3.0 kHz deviation from 300 to 3000 Hz	
POWER REQUIREMENTS	Regulated +9.6 volts dc @150 mA +13.6 volts dc @100 mA	
CONSTRUCTION	Fully solid-state	
METERING	Five test points critical to operation and alignment are accessible at a metering receptacle which permits testing with an optional built-in station meter, Motorola portable test set, or 0-50 uA microammeter with 2,000 ohms series resistance.	

1. DESCRIPTION

1.1 Models TLN5321A and TLN5322A Exciter provides the low power excitation for an FM transmitter. Up to four plug-in channel elements, one for each transmitter operating frequency, are used to develop a direct FM carrier signal of at least 400 milliwatts.

1.2 The exciter is directly frequency-modulated for crystal-controlled frequency

operation in the 132-174 MHz range. It consists of a symmetrical clipper and splatter filter, emitter follower, channel element(s) (voltage controlled crystal oscillator), buffer amplifier, tripler, first doubler, second doubler, and output amplifier. The fundamental crystal frequency is multiplied by twelve to provide the final output frequency.

1.3 When the exciter is used in "Private-Line" stations, a "Private-Line" encoder circuit

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1.3 When the exciter is used in "Private-Line" stations, a "Private-Line" encoder circuit

board is plugged directly into the mating pins of the exciter; and one jumper (JU402) is removed from the exciter; no interconnecting wires are used. The exciter board also includes additional pins that permit the board to be used with certain types of optional equipment. These pins are designated P403 on the exciter schematic diagram.

2. FUNCTIONAL OPERATION

Refer to the exciter block diagram and the exciter schematic diagram included in this section.

2.1 DEVIATION LIMITING CIRCUIT

2.1.1 Microphone output audio is applied to the symmetrical clipper and splatter filter. This circuit, together with amplifier U401, provides pre-emphasis, amplification, and limiting of the microphone audio. Microphone audio is then applied to emitter follower Q401 (together with "PL" code) through IDC control to the channel elements.

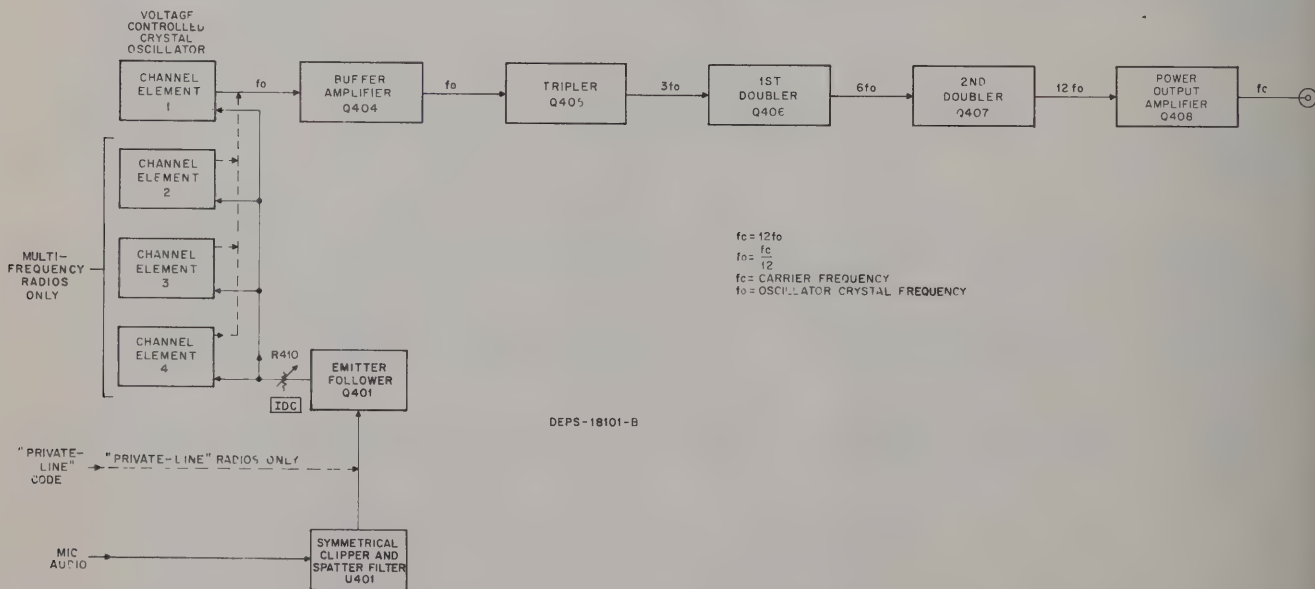
2.1.2 The output of the emitter follower is developed across IDC potentiometer R410. This audio signal can be monitored at pin 1 of the exciter metering receptacle. The potentiometer adjusts the maximum level of audio coupled to the oscillator-modulator, thus setting the amount of deviation.

2.1.3 In "Private-Line" radios, a low amplitude "Private-Line" code is continuously injected into the oscillator-modulator from the "Private-Line" encoder. This code range will produce 0.5 to 1.0 kHz deviation.

2.2 MODULATOR-OSCILLATOR STAGE (CHANNEL ELEMENT)

2.2.1 The combination modulator-oscillator stage (channel element) produces a low-power crystal frequency signal modulator at an audio rate. This signal is multiplied twelve times and amplified in following stages to produce the carrier signal. The channel element consists of a parallel combination varactor and warping capacitor connected in series with a crystal. A change in capacitance seen at the crystal terminals will cause the crystal to vary its resonant frequency in proportion to the capacitance change. The audio voltage from the audio and IDC circuitry is applied to the varactor to cause a change in capacitance; this variation in turn causes the frequency to change at the same audio rate.

2.2.2 Channel elements are highly stable crystal-controlled oscillators. They use unheated crystals in an oscillator circuit that is temperature compensated over the entire temperature range of -30°C to $+60^{\circ}\text{C}$ (-22°F to $+140^{\circ}\text{F}$). A variable warp capacitor in the base



Exciter Block Diagram

of each channel element is accessible through a hole in the exciter circuit board for fine frequency adjustment. Each channel element is a factory sealed, plug-in module which provides a train of stable frequency positive pulses.

2.2.3 The exciter accepts up to four channel elements - one channel element is required for each frequency. Only one frequency may be selected at a time, but transmission is possible on as many as four separate frequencies. A power input of +9.6 volts is applied to the channel element(s) continuously while the station is turned ON. Channel element output is developed only when a switched ground generated by the local or remote control unit is present. In single-frequency receivers, this switched ground is applied to a specific channel element as determined by the frequency selector switch associated with the station. An indication of the channel element output is available at pin 2 of the metering socket. This allows channel element operation to be easily checked with optional built-in station metering or with a Motorola Portable test set.

NOTE

If the station is equipped with a time-out timer module and the timer times out, keyed A- is removed from the modulator-oscillator(s) and the entire transmitter is shut down.

2.3 BUFFER AMPLIFIER

The buffer amplifier, Q404, is biased to operate as a Class A amplifier and provides reserve gain to isolate the modulator-oscillator from the succeeding stages.

2.4 MULTIPLIERS AND EXCITER POWER AMPLIFIER

2.4.1 The multipliers develop an output signal that is 12 times the channel element frequency and a final power amplifier gives power gain and matches the output impedance to 50 ohms.

2.4.2 The buffer amplifier output is developed across two parallel resonant tank circuits at the channel element frequency. Tripler Q405 operates as a Class C amplifier with its parallel resonant output tuned to the third harmonic of its input. Thus the output of the tripler is three times the channel element frequency. A meter connected at pin 3 of the metering receptacle measures the average dc base current which is proportional to input signal strength.

2.4.3 The first doubler circuit operates very similar to the tripler except its output is tuned to the second harmonic of its input and its drive is metered at pin 4. The output of the doubler is six times the channel element frequency.

2.4.4 The second doubler circuit also operates similar to the tripler with its output tuned to the second harmonic of its input. The drive to the second doubler is metered on pin 5 of the metering receptacle. The output signal is 12 times the channel element frequency and is the carrier frequency of the transmitter.

2.4.5 The exciter power amplifier also operates as a Class C amplifier. The amplifier provides at least 400 milliwatts of frequency modulated signal at the carrier frequency to the power amplifier section of the transmitter.

3. MAINTENANCE

3.1 METERING

The exciter is equipped with a metering receptacle which allows five major test points to be measured. The output of the exciter (input to the power amplifier) can be measured by using the metering receptacle on the power amplifier. With the portable test set connected to the metering receptacles, or by using the built-in station metering kit (if so equipped), readings may be made at each of the major test points in the circuit by merely rotating a selector switch. A failure in almost any portion of the exciter will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

NOTE

The exciter board must be installed in the transmitter for testing to provide the necessary power, ground, control and signal connections. The circuit board should always be secured in place with all mounting screws for operation and testing to provide good rf ground to all stages of the exciter. The exciter may be tested while installed in the station-- usually the preferred method. However, if desired, it can be bench tested in a "Micor" mobile radio, except that the time-out timer is inoperative.

TYPICAL EXCITER METER READINGS

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION (TEST SET ONLY)	READING	CIRCUIT METERED	IF LOW, THE DEFECTIVE CIRCUIT IS
1	A	2 (no mod) 6 (1 V rms @ 1 kHz exciter board pins 1 & 12)	Audio output of IDC circuit.	IDC circuit
2	A	25	Channel element output.	Channel element
3	A	38	Tripler input	Modulator or Tripler
4	A	22	1st doubler input	Tripler or 1st doubler
5	A	25	2nd doubler input	1st doubler or 2nd doubler

3.1.1 Built-In Station Metering

Step 1. The output of the exciter must be terminated into its normal point, the bandpass filter. The output of the power amplifier must be terminated in a 50-ohm dummy load or an antenna.

Step 2. Turn station ON.

Step 3. Set selector switch to position 1. Key the transmitter and whistle into the microphone long enough to observe the meter reading.

Step 4. Set selector switch to positions 2, 3, 4, and 5 respectively, keying the transmitter and observing the meter readings for each position (whistling not required). On multi-frequency stations, repeat the readings for each exciter frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows in the "Performance Tests" paragraph.

3.1.2 Portable Test Set

Step 1. Connect the 20-pin plug of the test set adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

Step 2. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control circuit board. Connect the white "metering" plug of the adapter cable to the metering receptacle on the exciter circuit board.

Step 3. Set function selector switch to the XMTR position.

Step 4. Set oscillator and meter reversing switch to OFF position.

Step 5. Set 1 V-100 mV switch on the adapter cable to the 100 mV position (TEK-37). On the later version adapter cable (TEK-37A), the switch is omitted and the unit operates at 100 mV sensitivity.

Step 6. Set the REF A-B switch on the adapter cable to position A.

Step 7. The output of the exciter must be terminated into its normal point, the bandpass filter. The output of the power amplifier must be terminated in a 50-ohm dummy load or an antenna.

Step 8. Turn station ON.

Step 9. Connect a microphone to the microphone receptacle on the portable test set or to the local or remote control board.

Step 10. Set selector switch to position 1. Key the transmitter and whistle into the microphone long enough to observe the meter reading.

Step 11. Set selector switch to positions 2, 3, 4, and 5 respectively, keying the transmitter with the XMTR ON pushbutton on the test set or the push-to-talk switch on the microphone and observing the meter reading for each position. On multi-frequency stations, repeat the readings for each exciter frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows in the "Performance Tests" paragraph.

Step 12. Move the "metering" plug to the power amplifier metering receptacle and observe the meter readings for selector switch position 1. The reference A-B switch must be set to the B position and the meter reversing switch to METER REV.

Each time maintenance is performed on the exciter, the readings should be compared

with the previous set of readings. Any degradation of performance will quickly be noted.

3.2 PERFORMANCE TESTS

The performance tests may be used for troubleshooting to isolate the point of abnormal performance. They may also be used after repair and alignment to assure that the exciter meets all specifications before it is returned to service.

3.2.1 Power Output Test

Step 1. Connect the equipment as connected for Metering (paragraph 3.1), except connect the test set "metering" plug to the power amplifier metering receptacle.

Step 2. Set selector switch to position 1. This checks the input to the power amplifier (output of the exciter). A meter reading of at least 20 uA equals an rf signal level of 400 milliwatts.

Step 3. On multi-frequency stations of ± 750 kHz separation, repeat the test for each exciter frequency. Select the frequency to be tested by the frequency selector switch associated with the station. The test set meter should indicate at least 20 uA for each frequency.

3.2.2 Frequency Test

Step 1. Terminate the transmitter in an antenna and measure the radiated signal with a Motorola digital frequency meter and deviation monitor or other highly accurate frequency measuring device ($\pm .00005\%$ or better).

NOTE

When high stability channel elements are used, carrier frequency must be within .0002%.

Step 2. Key the transmitter to produce an unmodulated carrier signal. In "Private-Line" tone-coded stations disable the "Private-Line" encoder by unplugging the "Vibrasender" resonant reed. In "Digital Private-Line" stations, disable the code by shorting together the two "code disable" pins on the PL encoder board.

NOTE

Do not use the push-to-talk switch on the microphone. Background noise will modulate the signal.

Step 3. Read the transmitter output frequency. On multi-frequency stations, repeat the test for each frequency.

Step 4. If adjustment is required, set the "warp" capacitor on the associated channel element for the assigned frequency output. For best accuracy, the radio set should be brought to room temperature ($+70^{\circ}$ to 75° F) and the test equipment thoroughly warmed up. This brings the channel element to the center of its temperature compensation range.

3.2.3 Deviation Test

Step 1. Terminate the transmitter output in an antenna and measure the radiated signal with a deviation meter.

Step 2. In "Private-Line" tone-coded squelch stations, re-insert the "Vibrasender" resonant reed if it was removed in the previous test. In "Digital Private-Line" stations, remove the code disable short. Key the transmitter with only "Private-Line" code modulation. The deviation meter should indicate 0.5 to 1 kHz.

Step 3. Connect an audio oscillator output to exciter board pins 1 (Gnd) and 12 (Audio High). Adjust the audio oscillator to 1000 Hz and 1 volt as measured on an AC voltmeter. The deviation meter should indicate ± 5 kHz deviation.

Step 4. Adjust the audio oscillator over the entire 300 to 3000 Hz range, keeping the audio level at approximately 1 volt. The deviation meter should never exceed ± 5 kHz nor drop below ± 2.5 kHz.

3.2.4 Audio Sensitivity Test

Step 1. After completion of the Deviation Test, reduce the output of the audio oscillator to 130 millivolts at 1000 Hz.

Step 2. The deviation meter should indicate approximately ± 3.0 kHz. Meter position 1 may be noted at this time for future reference. Future audio sensitivity checks may then be made by comparing the meter 1 reading with the reference value.

3.3 TROUBLESHOOTING

3.3.1 If there are no test set indications at one or more of the metered points, check the dc input voltages to the exciter circuit board.

P402-11 & 13	+9.6 volts in respect to chassis
P402-6	Keyed A- (approximately -13.6 volts in respect to A+, pin 7).

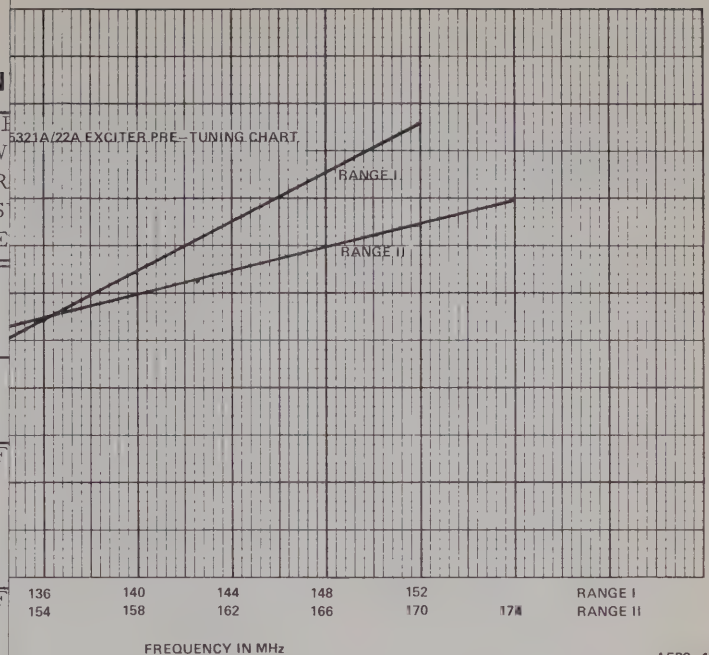
3.3.2 If test set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

NOTE

In "Private-Line" stations, the transmitter cannot be keyed if the PL encoder is removed unless a jumper (JU402) is connected from pin 8 to pin 10 of the exciter to complete the keying circuit. This jumper is permanently connected in exciters for non-"Private-Line" operation.

ALIGNMENT

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER SWITCH POSITION (SE)
1				
2	POWER SET			
3	FRE- QUENCY SWITCH	EXCITER	2	OFF
4	ALL EXCITER COILS	EXCITER	5	OFF
5	L401	EXCITER	2	OFF
6	L401, L402	EXCITER	3	OFF
7	L403	EXCITER	3	OFF
8	L403, L404	EXCITER	4	OFF
9	L405	EXCITER	4	OFF
10	L405, L406	EXCITER	5	OFF
11	L407 L408	EXCITER	5	OFF
12	L407, L408	PA	1	METER RESET
13				
14				



AEPS-17626-0

FREQUENCY ADJUSTMENT

Set the transmitter with the XMTR ON pushbutton on the microphone. On "Private-Line" stations, unplug the "Vibrator". On "Digital Private-Line" stations short to the "Digital Private-Line" encoder board.

Adjust the frequency for the selected channel to the exact desired frequency. Adjust the channel element warp capacitor. On multi-frequency stations, the frequency selector switch setting; re-

ALIGNMENT PROCEDURES

NOTE

Frequency deviation must be measured with a deviation meter with RTC-4000A Deviation Meter for frequency response of less than 1 Hz,

at the frequency before setting "IDC". Connect the audio input to the audio output, and 12, Audio High).

On tone "Private-Line" models, replace the short from the "Digital Private-Line" models, remove the short from

METER

Alignment may be performed with the S1059B Portable Test Set or a portable test set usage -- polarized as required when built-in static readings are based on a two-thousand series resistance in the meter. A two-thousand ohm series resistor is corrected.

Control for ± 5 kHz deviation. Essentially full deviation should still be indicated a weak audio stage.

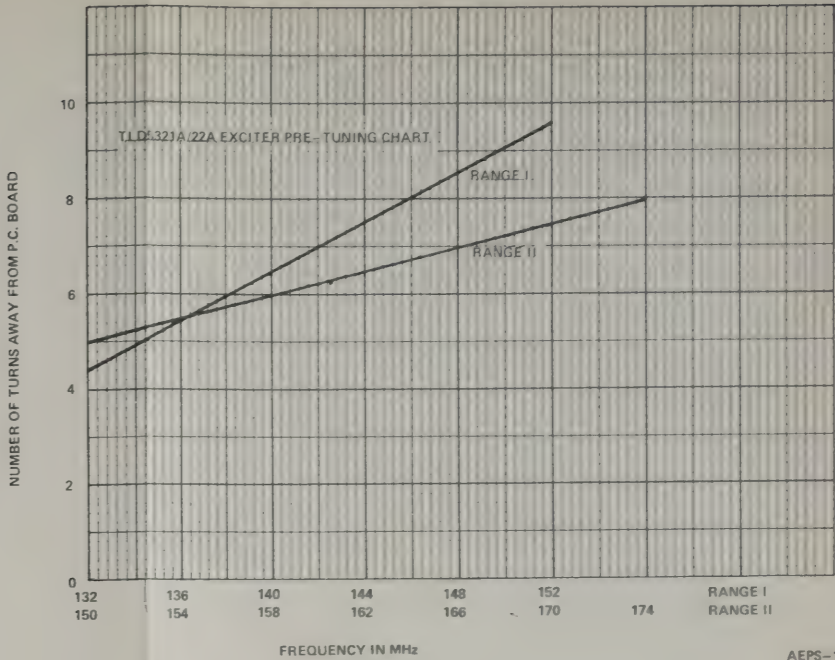
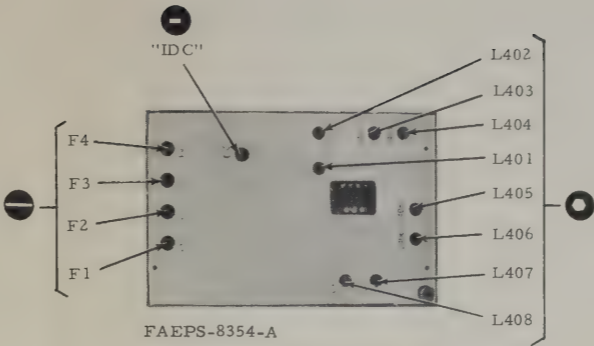
Exciter Alignment Procedure
Motorola No. PEPS-8356-G
6/20/80-PHI

ALIGNMENT PROCEDURE

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. SWITCH AND REF A-B SWITCH (SEE NOTE)	STAGE AND PROCEDURE
1					SET UP - Key the transmitter with the XMTR ON pushbutton on the portable test set.
2	POWER SET				OUTPUT - Turn the POWER SET control fully counterclockwise. Unkey the transmitter.
3	FRE- QUENCY SWITCH	EXCITER	2	OFF REF A	CHANNEL ELEMENT - Select the desired frequency on multi-frequency stations. Key the transmitter. The test set meter 2 should indicate at least 10 uA.
4	ALL EXCITER COILS	EXCITER	5	OFF REF A	PRE-ALIGNMENT - If the exciter is completely untuned and shows no meter 5 readings, set cores of tuning coils L401 to L406 to the top of their coil forms (away from circuit board). Set cores of L407 and L408 per the exciter pre-tuning chart. If a meter 5 reading is available proceed to step 7.
5	L401	EXCITER	2	OFF REF A	BUFFER OUTPUT - Tune L401 for minimum meter reading.
6	L401, L402	EXCITER	3	OFF REF A	BUFFER OUTPUT - Tune L402 and then L401 for peak meter reading.
7	L403	EXCITER	3	OFF REF A	TRIPLER OUTPUT - Tune L403 for minimum meter reading.
8	L403, L404	EXCITER	4	OFF REF A	TRIPLER OUTPUT - Tune L404 and then L403 for peak meter reading.
9	L405	EXCITER	4	OFF REF A	FIRST DOUBLER OUTPUT - Tune L405 for minimum meter reading.
10	L405, L406	EXCITER	5	OFF REF A	SECOND DOUBLER OUTPUT - Tune L406, and then L405 for peak meter reading.
11	L407 L408	EXCITER	5	OFF REF A	EXCITER OUTPUT - Tune L407 then L408 for peak meter reading.
12	L407, L408	PA	1	METER REV REF A	EXCITER OUTPUT - Move the metering plug to the PA. Tune L408 and then L407 for peak meter reading.
13					Repeat steps 6, 8 and 10.
14					Align the power amplifier.

METERING NOTE

Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage -- polarity is automatically reversed as required when built-in station metering is used. All meter readings are based on a two-thousand ohm (2000 Ω) equivalent series resistance in the meter. Therefore, meters not having a two-thousand ohm series resistance must have their readings corrected.



OSCILLATOR FREQUENCY ADJUSTMENT

- Key the transmitter with no modulation (key the transmitter with the XMTR ON pushbutton on the portable test set rather than with the microphone). On "Private-Line" stations, unplug the "Vibrator" resonant reed from the PL tone generator. On "Digital Private-Line" stations short together the code disable pins on the "Digital Private-Line" encoder board.
- Adjust the channel element warp capacitor for the selected channel to the exact desired frequency. On single-frequency models, adjust the F1 channel element warp capacitor. On multi-frequency models, adjust the warp capacitor which corresponds to the frequency selector switch setting; repeat for each frequency.

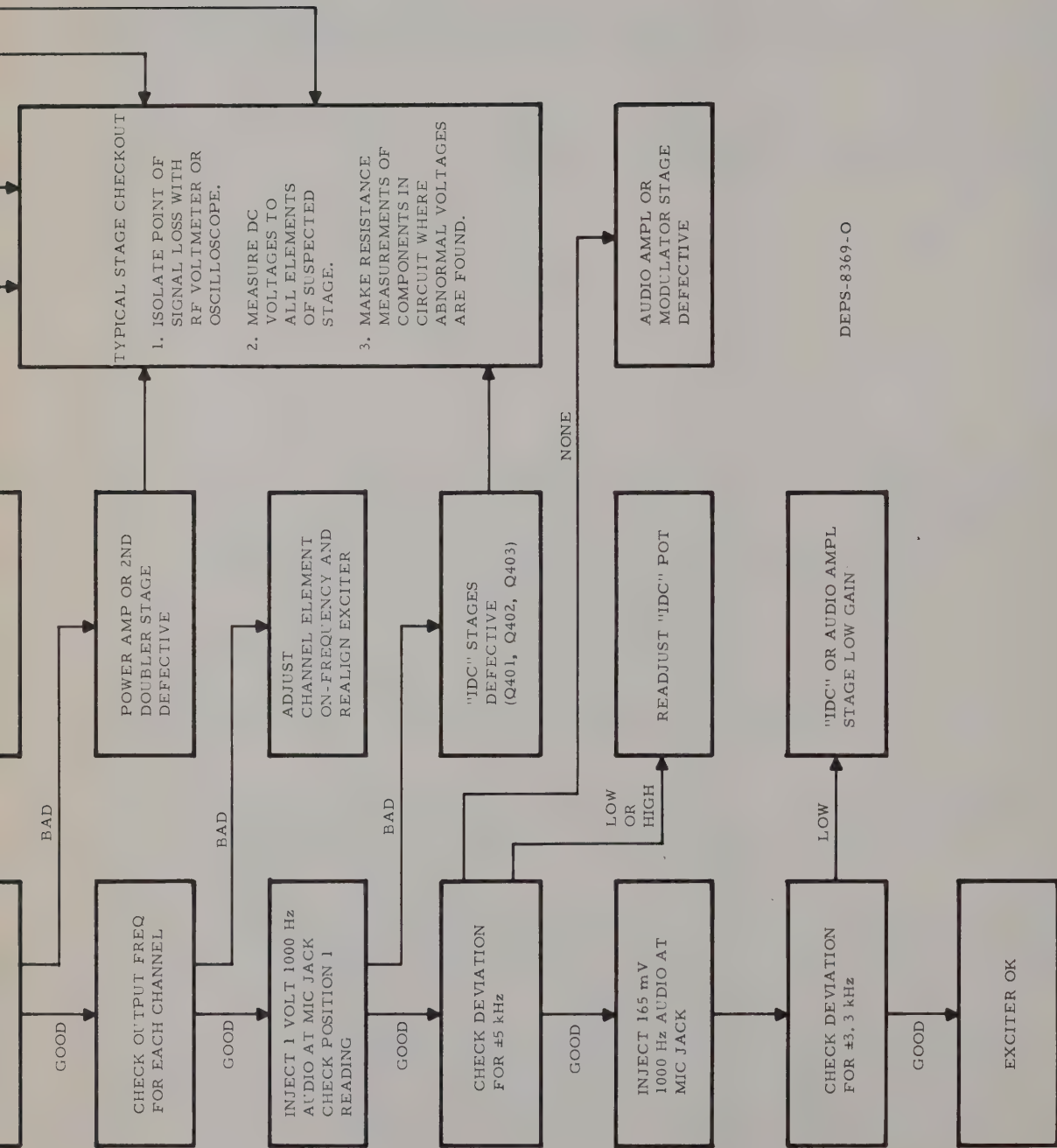
"IDC" ADJUSTMENT PROCEDURES

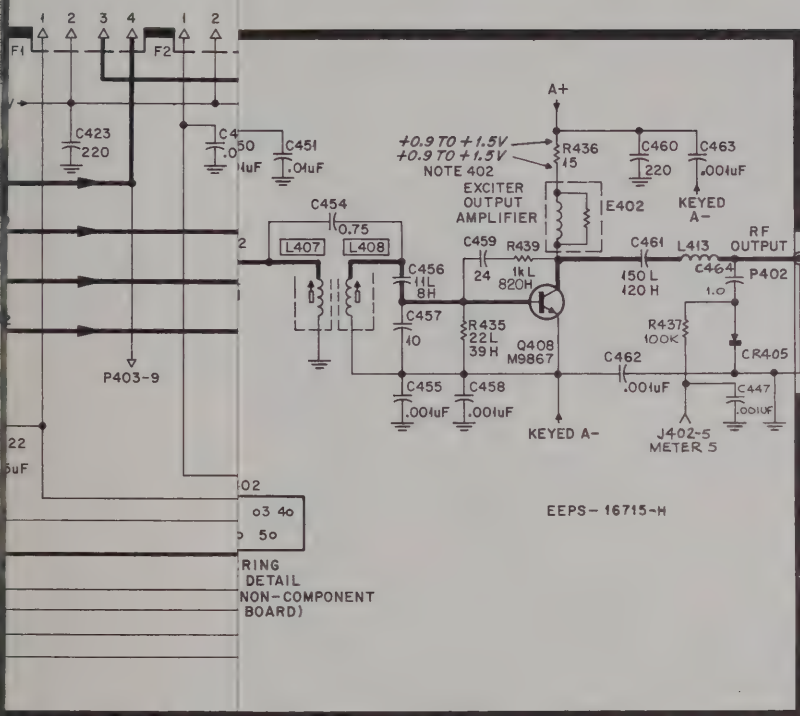
NOTE

For "Digital Private-Line" stations, deviation must be measured with a Motorola R-1200 Series Service Monitor with RTC-4000A Deviation Meter Plug-In Module that has been modified for frequency response of less than 1 Hz, or equivalent.

- Each channel element must be "warped" on frequency before setting "IDC". Connect the audio oscillator to the exciter input (pins 1, GND, and 12, Audio High).
- Set the audio oscillator to 1000 Hz and 1 volt. On tone "Private-Line" models, replace the "Vibrator" resonant reed. On "Digital Private-Line" models, remove the short from the code disable pins.
- Key the transmitter and adjust the IDC control for ± 5 kHz deviation.
- Reduce the tone oscillator output to .25 volt. Essentially full deviation should still be indicated. Less than full deviation may indicate a weak audio stage.

ROUTING CHART

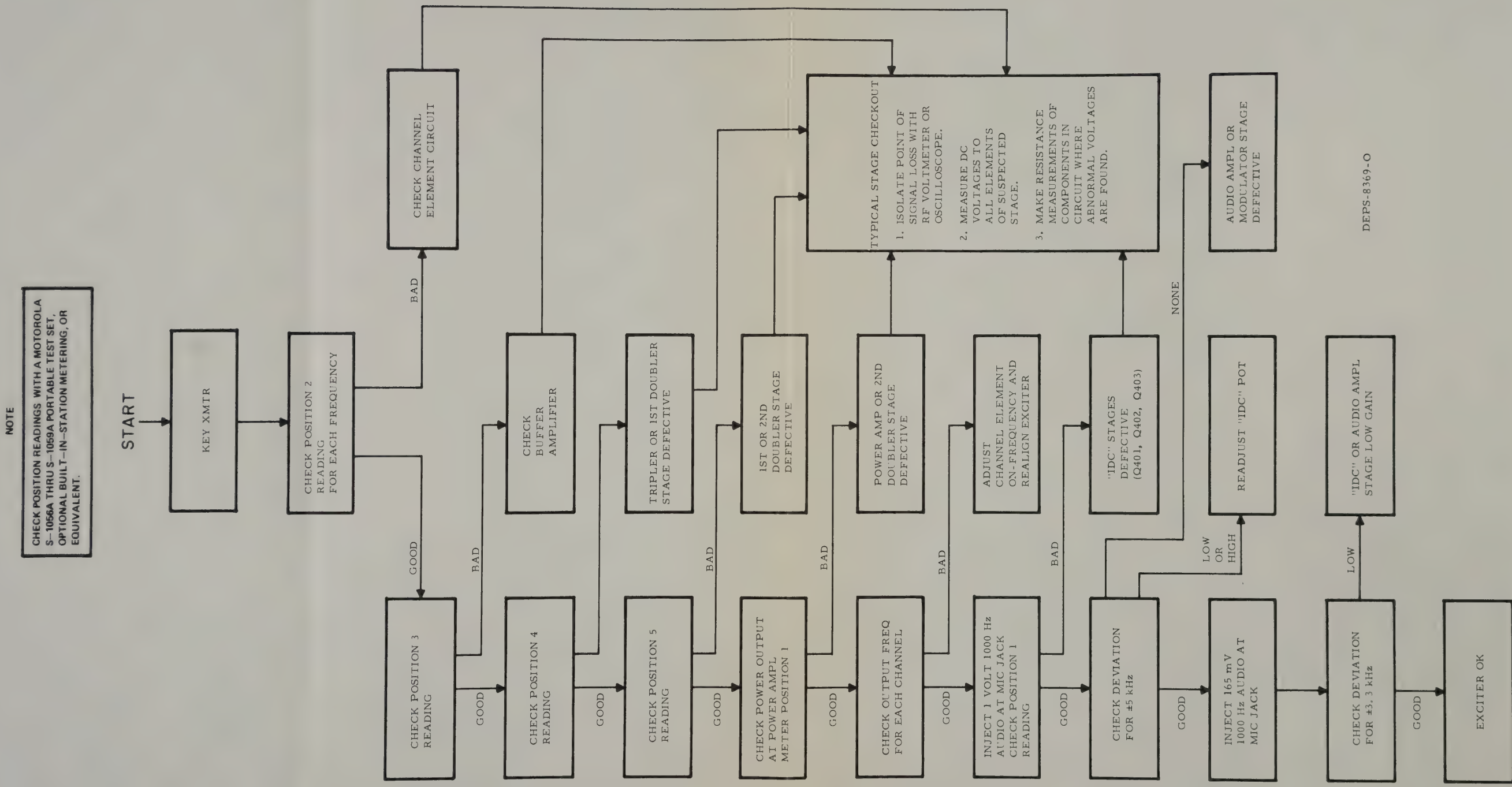


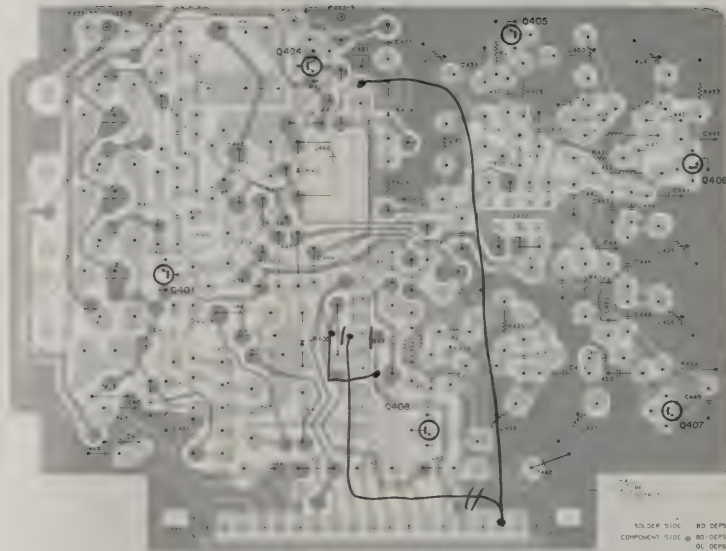


- NOTES:
401. TRANSMITTER FREQUENCY CALCULATION:
 $f_o = \frac{f_c}{12}$ $f_c = f_o \cdot 12$
- WHERE:
 f_o = CHANNEL ELEMENT FREQUENCY
 f_c = CARRIER FREQUENCY
402. VOLTAGE MEASURED ACROSS R436.
403. HIGH IMPEDANCE TRANSISTORIZED VOLTMETERS (11 MEGOHM) NOT RECOMMENDED.
404. UNLESS OTHERWISE STATED, VOLTAGES MEASURED IN RESPECT TO CHASSIS GROUND.
405. UNLESS OTHERWISE STATED CAPACITOR VALUES ARE IN PICO FARADS.
406. JU401 REMOVED IN "PRIVATE-LINE" RADIOS.
407. R401 REMOVED IN REMOTE CONTROL STATIONS.
408. WHEN CODE INPUTS ARE APPLIED VIA P401-10, R405 MUST BE REMOVED FROM THE CIRCUIT.
409. R404 AND R405 ARE FACTORY SELECTED SO THAT PRIVATE LINE DEVIATION FALLS BETWEEN 500 HZ AND 1000 HZ LIMITS.

PREVIOUS REVISIONS AND PARTS LIST
 SHOWN ON BACK OF THIS DIAGRAM
 TLD5320A Series Exciter Schematic
 Diagram and Circuit Board Detail
 Motorola No. PEPS-16953-H
 6/20/80-PHI

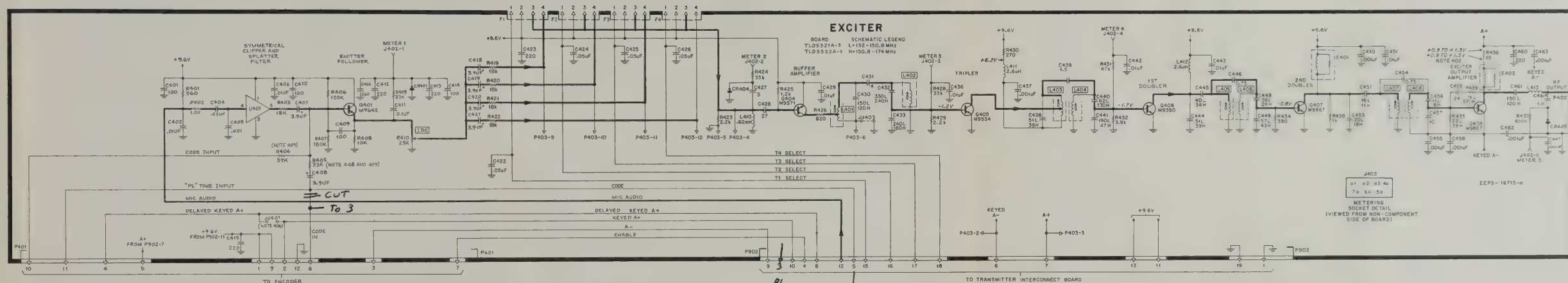
EXCITER TROUBLESHOOTING CHART





To PL Board 11 PL OUT

30 DEC 81 80 DEPS 16779-D
COMPONENT SIDE 80 DEPS 16780-D
01 DEPS 13719-A



NOTES

401. TRANSMITTER FREQUENCY CALCULATION
 $f_o = f_c \pm \frac{f_m}{2}$
 WHERE:
 f_o = CHANNEL ELEMENT FREQUENCY
 f_c = CARRIER FREQUENCY
 f_m = MODULATING FREQUENCY
 402. VOLTAGE MEASURED ACROSS R436
 403. HIGH IMPEDANCE TRANSISTORIZED VOLTMETERS
 404. UNLESS OTHERWISE STATED, VOLTAGES MEASURED
 IN RESPECT TO CHASSIS GROUND
 405. UNLESS OTHERWISE STATED, CAPACITOR VALUES
 ARE IN PICOFARADS
 406. J4041 REMOVED IN "PRIVATE-LINE" RADIOS
 407. R401 REMOVED IN REMOTE CONTROL STATIONS
 408. WHEN CODE INPUTS ARE APPLIED VIA P403-10,
 R401 MUST BE REMOVED FROM THE CIRCUIT
 409. R404 AND R405 ARE FACTORY SELECTED SO THAT
 AND 1000HZ - 10KHZ

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM
TLD5320A Series Exciter Schematic
Diagram and Circuit Board Detail
Motorola No. PEPS-16953-H
6/20/80-PHI

90/100 W POWER AMPLIFIER BOARD

TLD5940A SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE
TLD5942A	132-150.8 MHz
TLD5943A	150.8-162 MHz
TLD5944A	162-174 MHz

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifier boards provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

90/110 W POWER AMPLIFIER



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

-Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

-Diode protection against reverse polarity voltage (board mounted diode).

-Output protection provided by a control stage transistor driven by power control circuit. (Controls gain of the first stage). In intermittent duty stations, a single-wire connection provides interconnection between power control and PA circuitry. In continuous duty stations three wire connections provide the interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband matching network and applied to the pre-driver stage. A second ferrite transformer is utilized to match the single-ended output of the pre-driver stage to the input of the push-pull driver stage. The output of the driver stage is split by a pair of transformers to drive each of the push-pull final power amplifier stages. The output from each final stage is stepped up in impedance by ferrite transformers and paralleled to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pins 3 and 4 reflect the output drive signal and operation of the two push-pull power amplifier stages. Reference position A on a Motorola Portable Test

Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board. It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in metering or a Motorola portable test set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA. All such equipment is battery operated which permits testing to be performed in the field where no commercial power is available for bench type test equipment. Option built-in station metering when incorporated takes the place of the portable test set.

(1) Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however a low impedance multimeter is acceptable for dc voltage measurements only.

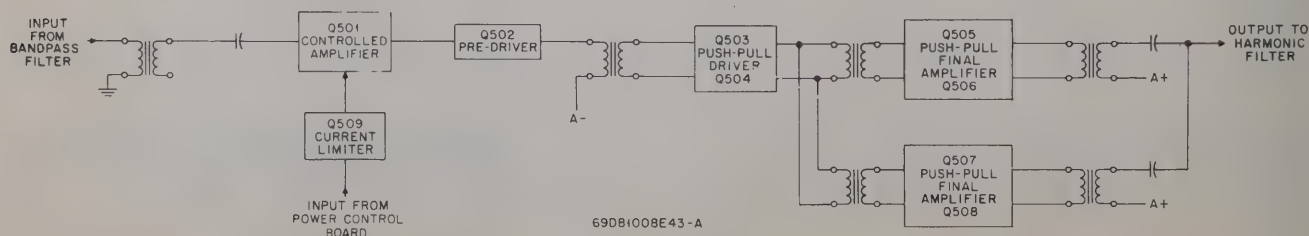


Figure 1. Block Diagram

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Test Set Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station meter kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

The optional built-in station metering is similar to the portable test set except PA voltage is measured with the two voltage probes. The built-in metering polarity switch is set to REV for PA metering and FWD for Power Control Board metering.

a. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

b. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

c. Turn the station ON.

d. With the meter selector switch set to PA position 1 and the meter plug connected to the power amplifier, key the transmitter and observe the meter. Unkey the transmitter.

Set the selector switch to position 2, 3, and 4 keying the transmitter and observing the meter reading for each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows the "Using the Portable Test Set" paragraphs.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows.

a. Set the function selector switch of the portable test set to the XMTR position.

b. Set the meter reversing switch of the test set to the METER REV position, the selector switch to position 1, and REF switch to position A.

c. Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

d. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

e. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

f. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

g. Turn the station ON.

h. Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

i. Set the selector switch to positions 2, 3, & 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for

each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be operating normally.

(b) The power control board should be known to be functioning normally.

(2) Key the transmitter and observe power out, which should be 90, 100, or 110 watts, depending upon licensing.

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	PORT. TEST SET REF. SW.	STATION METERING POL SW.	MINIMUM METER READING	CIRCUIT METERED	IF LOW, DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	REV	15 uA	Exciter Output (input to Controlled Amplifier Q501)	Exciter output, input circuitry of controlled amplifier stage Q501
2	A	REV	5 uA	Input of Pre-driver Stage (Q502)	Output of controlled amplifier stage input circuitry of predriver stage
3	A	REV	12 uA (100 W/ 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q505, Q506	Input of Q505, Q506 stages, output of driver stage (Q502, Q503), output of predriver stage Q502
4	A	REV	12 uA (100 W/ 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q507, Q508	Input of Q507, Q508 stage output of driver stage Q502, Q503. Output of predriver stage Q502
5	B	REV	21 uA min. — 90 W 27 uA max. — 23 uA min. — 100 W 37 uA max. — 110 W	Total Current in Final Amplifier Stages Q505, Q506, Q507, Q508	Output of final amplifier stages Q505-Q508, power control board antenna switch, antenna.
6 (Or 25 V SEE NOTE)	B	FWD	12 V (0-30 V scale on portable test set, 25 V full scale on built-in metering)	Final Amplifier Stage	Final amplifier stage A+ or A- input.

NOTE: When using optional built-in station metering, the two voltage probes are used to measure PA voltage.

(3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the radio set and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA decks, several checks can be made prior to extensive troubleshooting.

a. Visual

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for proper voltages at the collectors of each transistor. Certain defects such as broken plating, broken leads etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarizes these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of P-N-P transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection of "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

The schematic diagram of the PA board contains the voltage readings required for troubleshooting. The readings are typical for normal operating conditions at rated power output for the radio. Refer to the troubleshooting chart, and the schematic when a defect is suspected in the PA board.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at both base and emitter, BOTH devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type de-soldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

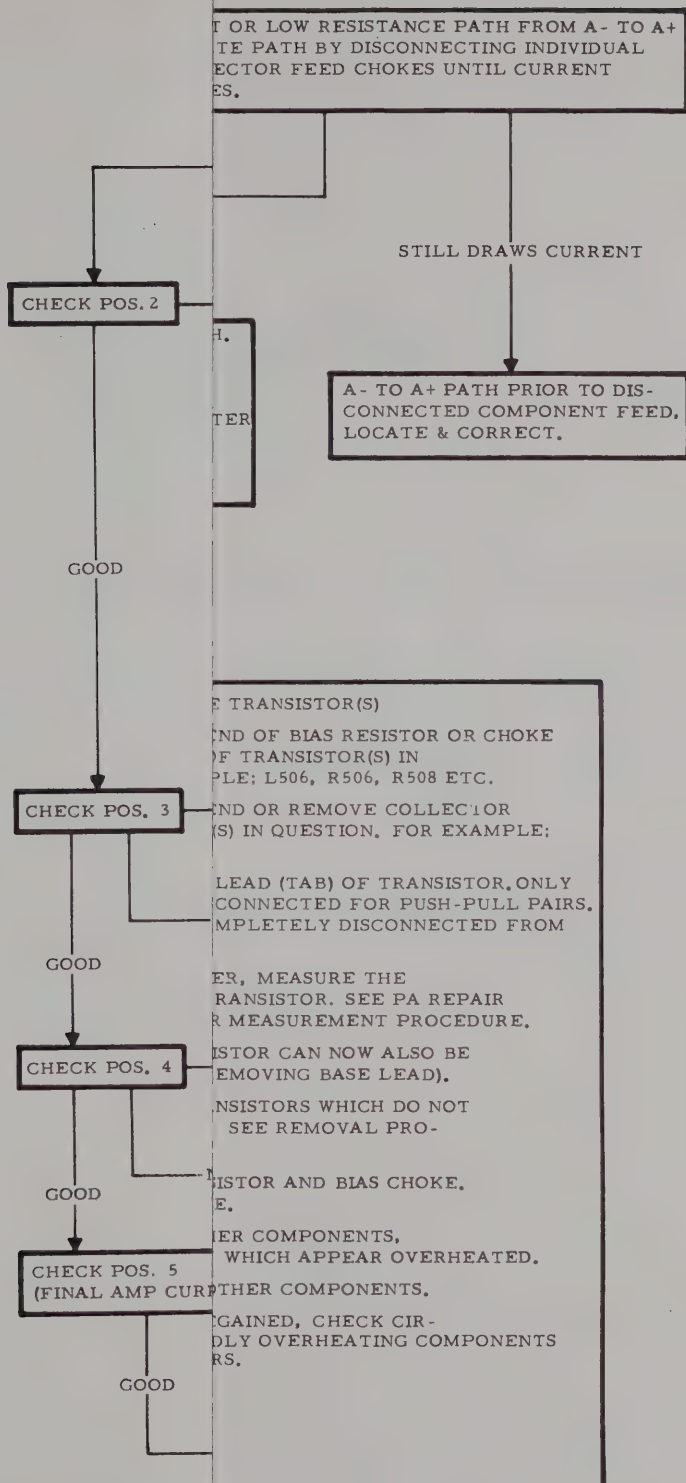
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

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(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

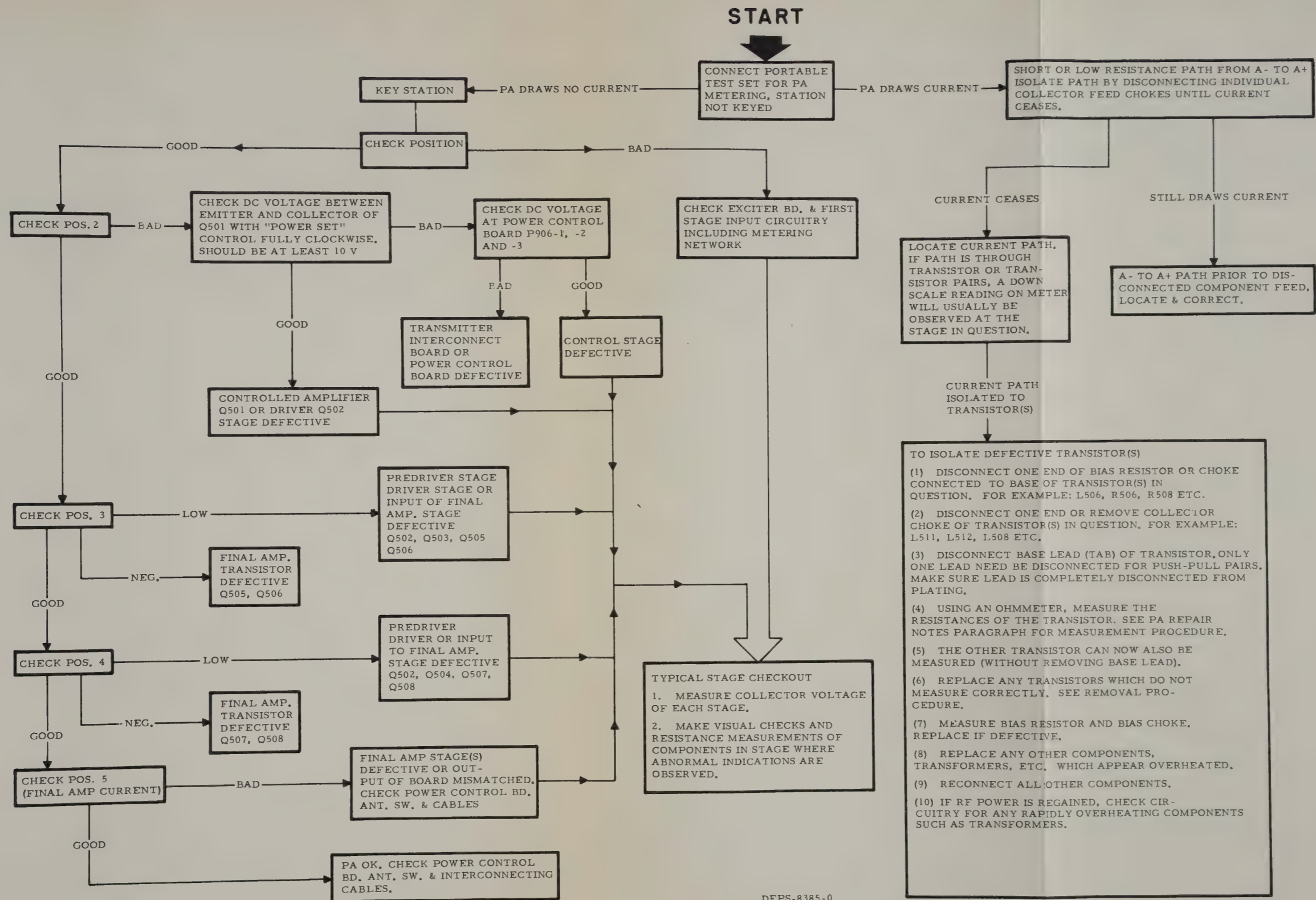
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



POWER AMPLIFIER ALIGNMENT PROCEDURE

PORTABLE TEST SET		OPTIONAL BUILT-IN METERING		ADJUST	STAGE AND PROCEDURE
TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER SELECTOR SWITCH	POLARITY SWITCH		
--	--	--	--	--	Align the exciter.
--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
--	--	--	--	C501, C502	PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 plates fully meshed.
Wattmeter or 1	METER REV. REF A	PWR CONT 1	FWD	POWER SET	OUTPUT - Without exceeding rated power output on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA Meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
5	METER REV. REF B	PWR CONT 5	FWD	C501, C502	PA DRIVER OUTPUT - Tune C501, then C502, for minimum meter 5 reading.
Wattmeter or 1	METER REV. REF A METER REV. REF B	PWR CONT 1 PWR CONT 5	FWD FWD	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 4 and 5). Check meter reading, it must not exceed 50 uA.
5	METER REV. REF B	PWR AMP 5	REV	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 25 A. Therefore, to measure the final collector current (I_C) in amperes, take 1/2 the meter reading.
6	METER REV. REF B	25 V (Use voltage probes)	FWD	--	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_C). V_C is the meter 6 reading (0-30 V scale on portable test set, 25 V full scale on built-in metering).
--	--	--	--	--	Determine final input power (P_{in}). P_{in} equals $V_C \times I_C$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

NOTE
Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage -- polarity is automatically reversed as required when built-in station metering is used.

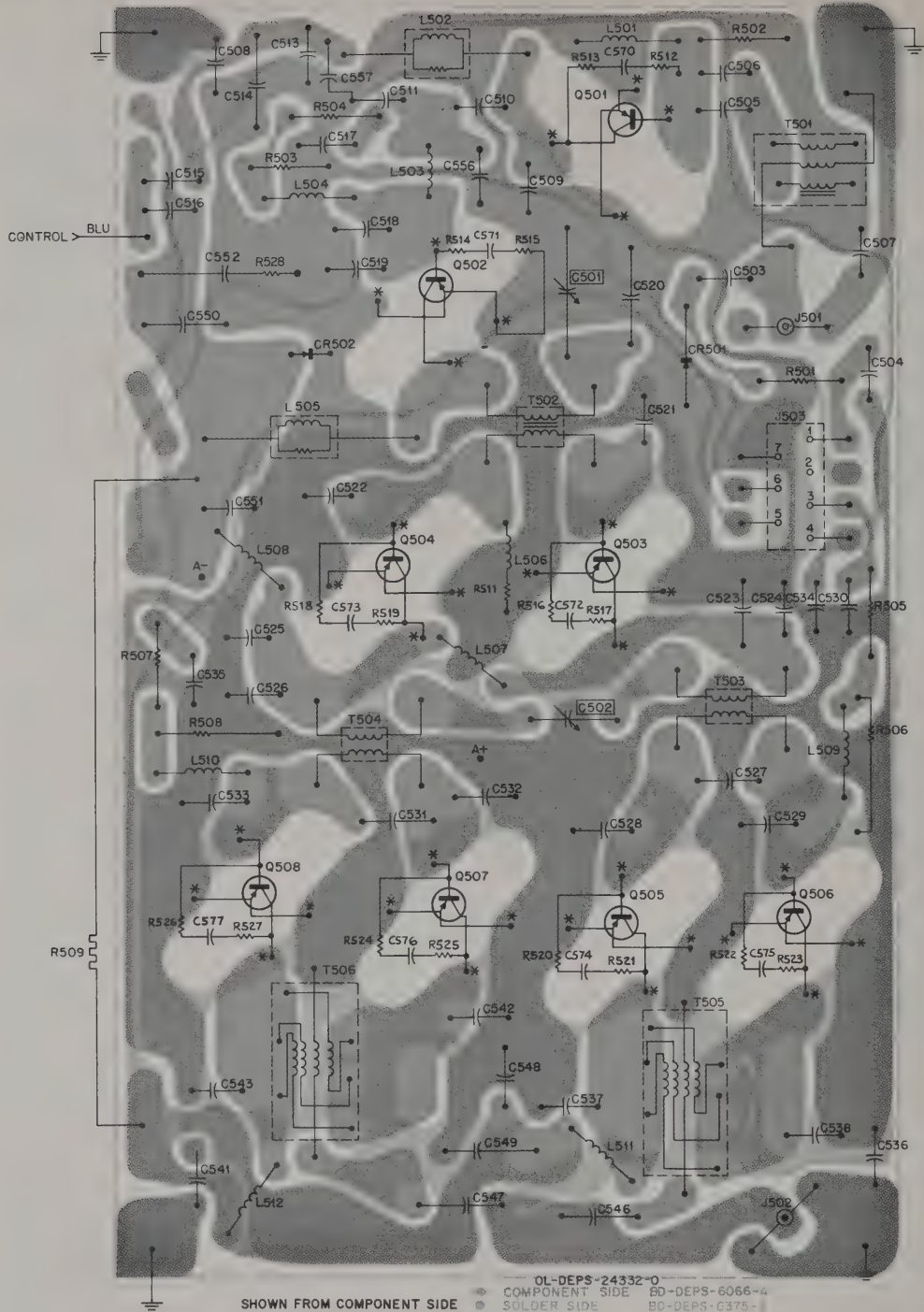
EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

- Radio transmitters may be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
- The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization. This power input shall be measured and the results recorded:
 - When the transmitter is initially installed.
 - When any change is made in the transmitter which may increase the power input.
 - At intervals not to exceed one year.
- Frequency and deviation of a transmitter must be checked:
 - When it is initially installed.
 - When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - At intervals not to exceed one year.

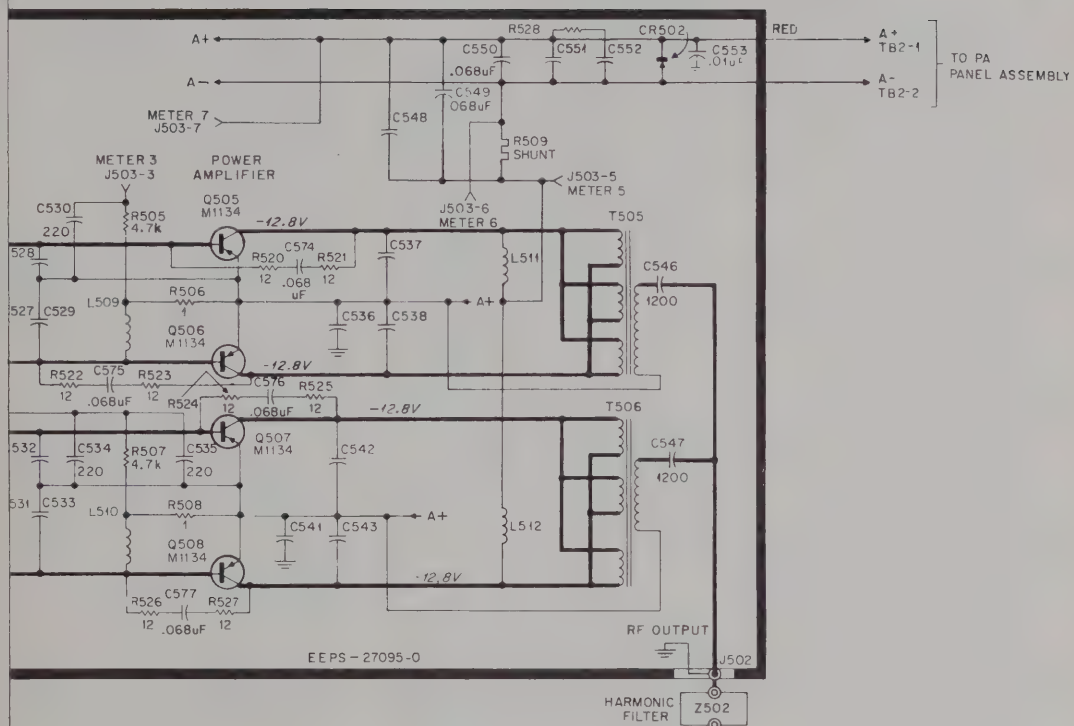
POWER AMPLIFIER ALIGNMENT PROCEDURE

STEP	METERING PLUG LOCATION	PORTABLE TEST SET		OPTIONAL BUILT-IN METERING		ADJUST	STAGE AND PROCEDURE
		TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER SELECTOR SWITCH	POLARITY SWITCH		
1	--	--	--	--	--	--	Align the exciter.
2	--	--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
3	--	--	--	--	--	C501, C502	PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 plates fully meshed.
4	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A	PWR CONT 1	FWD	POWER SET	OUTPUT - Without exceeding rated power output on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA Meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
5	POWER CONTROL BOARD	5	METER REV. REF B	PWR CONT 5	FWD	C501, C502	PA DRIVER OUTPUT - Tune C501, then C502, for minumum meter 5 reading.
6	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A METER REV. REF B	PWR CONT 1 PWR CONT 5	FWD FWD	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 4 and 5). Check meter reading, it must not exceed 50 uA.
7	PA	5	METER REV. REF B	PWR AMP 5	REV	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 25 A. Therefore, to measure the final collector current (I _C) in amperes, take 1/2 the meter reading.
8	PA	6	METER REV. REF B	25 V (Use voltage probes)	FWD	--	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V _C). V _C is the meter 6 reading (0-30 V scale on portable test set, 25 V full scale on built-in metering.
9	--	--	--	--	--	--	Determine final input power (P _{in}). P _{in} equals V _C x I _C . P _{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

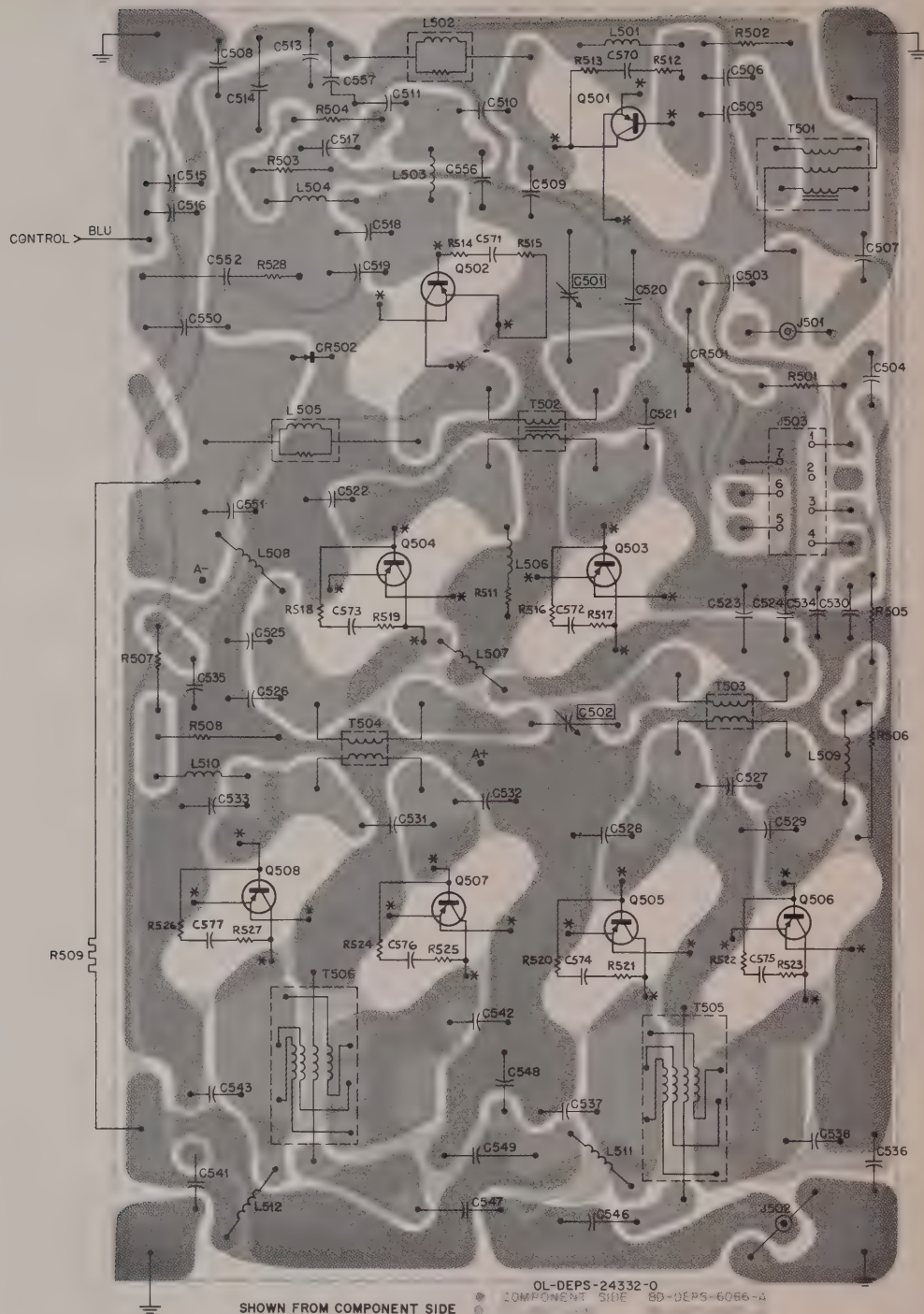


* THESE TRANSISTOR LEADS ARE
 CONNECTED TO ONLY THE COMPONENT
 SIDE OF THE BOARD

90/110 W Power Amplifier
 Circuit Board Detail
 Motorola No. PEPS-24462-0
 6/20/80-PHI



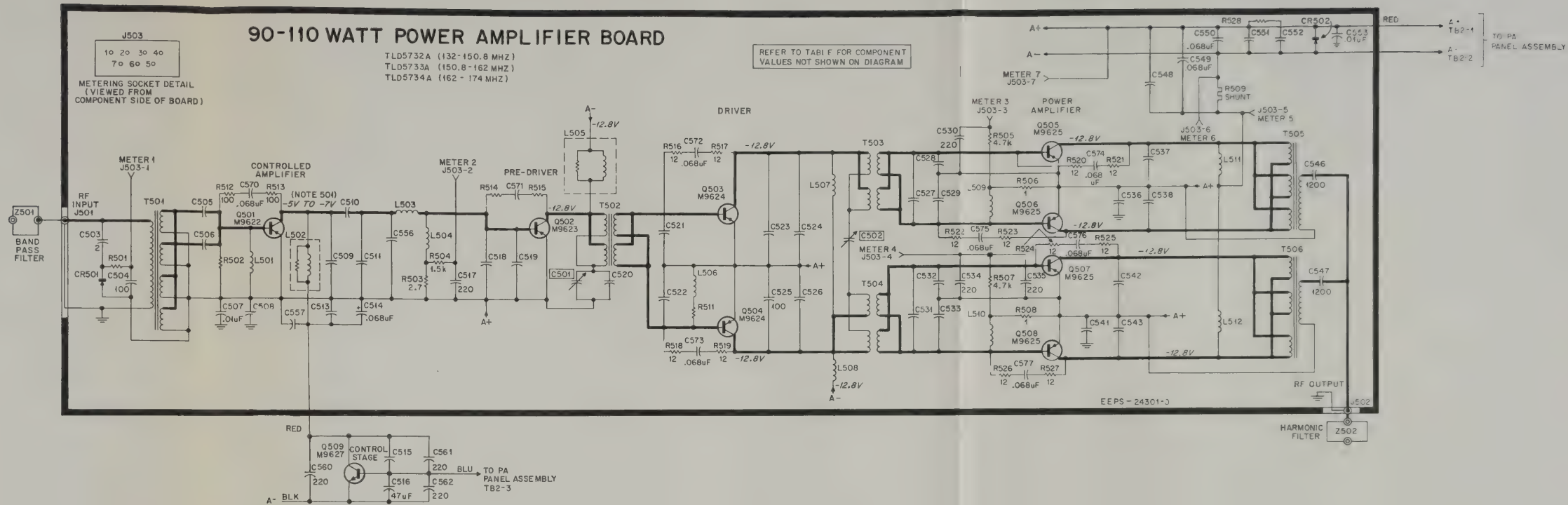
PARTS LIST SHOWN ON
 BACK OF THIS DIAGRAM
 90/110 W Power Amplifier
 Schematic Diagram
 Motorola No. PEPS-27096-O
 6/20/80-PHI



90/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-24462-0
6/20/80-PHI

PA COMPONENT VALUES			
REF SYMBOL	132-150.8 MHz	150.8-162 MHz	162-174 MHz
C501	4-40	1.5-18	1.5-18
C502	2.4-27	2-19.3	2-19.3
C505	62	49	62
C506	62	51	34
C508	160	130	130
C509	15	15	10
C510	175	51	39
C511	62	NOT USED	NOT USED
C513	160	130	130
C515	NOT USED	NOT USED	3.3 uF
C518	49	60	49
C519	49	60	43
C520	30	25	20
C521	62	43	43
C522	56	39	51
C523	80	100	120
C524	NOT USED	.01 uF	.05 uF
C526	NOT USED	.01 uF	.05 uF
C527	43	36	24
C528	75	75	80
C529	60	51	51
C531	43	36	24
C532	75	75	80
C533	62	60	68
C536	220	390	NOT USED
C537	130	150	100
C538	130	150	120
C541	220	130	130
C542	130	150	100
C543	120	130	100
C548	160	130	130
C551	160	130	130
C552	15 uF	100 uF	100 uF
C556	30	10	6
C557	NOT USED	NOT USED	4.7 uF
C571	NOT USED	.068 uF	.068 uF
L503	7-84400B03	1-1/2 TURNS	1-1/2 TURNS
L504	1 TURN	1 TURN	85 nH
L506	.29 uH	39 nH	.29 uH
L509	.29 uH	39 nH	.29 uH
L510	.29 uH	39 nH	.29 uH
R501	100k	150k	150k
R502	10	10	47
R511	NOT USED	2.7	NOT USED
R514	NOT USED	100	51
R515	NOT USED	100	51
R528	NOT USED	NOT USED	2.7
T503	24-84302C01	24-84464D01	24-82060L01
T504	24-84302C02	24-84464D01	24-82060L01
T505	25-84812B01	24-84812B01	25-84398B01
T506	25-84812B01	24-84812B01	25-84398B01

EPS-24303-O



POWER AMPLIFIER

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED: CAPACITOR VALUES ARE IN PICOFARADS.

EPS-24302-O

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
90/110 W Power Amplifier
Schematic Diagram
Motorola No. 63P81036E15-O
6/20/80-PHI

DESCRIPTION

PL-5500-O

CAPACITOR, fixed: 220 pF ±20%; 500 V
TRANSISTOR: (SEE NOTE) NPN; type M9627
CED ITEMS
BRACKET ASSEMBLY includes: BRACKET, transistor mounting SOCKET, transistor SCREW, tapping: 6-20 x 1/2; 2 used WASHER, lock: #6 (external tooth); 2 used INSULATOR, transistor LUG, solderless LUG, flanged spade: 2 used STRAP, cable harness: 4 used

t
PL-5501-O

CAPACITOR, fixed: 068 uH ±10%; 100 V
RESISTOR, fixed: ±10%; 1/2 W: 00 2

PL-5503-O

CAPACITOR, fixed: 068 uF ±10%; 100 V
RESISTOR, fixed: 00 ±10%; 1/2 W 1 ±5%; 1/2 W 2 ±10%; 1/2 W

90/100 W POWER AMPLIFIER BOARD

TLD 5730A SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE
TLD5732A	132-150.8 MHz
TLD5733A	150.8-162 MHz
TLD5734A	162-174 MHz

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifier boards provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.



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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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LEGEND:
L = 132-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD5732A Power Amplifier Board (132-150.8 MHz)
TLD5733A Power Amplifier Board (150.8-162 MHz)
TLD5734A Power Amplifier Board (162-174 MHz)

PL-5504-O

NOTE		
This parts list covers more than one model. Where differences exist a letter code is added to the reference symbol to indicate the applicable unit.		
C501L	20-83201B09	CAPACITOR, fixed: pF; $\pm 5\%$; 500 V; unless otherwise stated
C501M, 501H	20-83201B07	variable; 4-40; 100 V
C502L	19-83491E08	variable; 1.5-18; 100 V
C502M, H	19-83491E07	variable; 2.4-27
C503	21-83406D52	variable; 2-19.3
C504	21-84494B04	2 ± 0.25 pF
C505L	21-84494B02	100
C505M	21-84494B25	62
C505H	21-84494B02	49
C506L	21-84494B02	62
C506M	21-84494B01	62
C506H	21-84494B30	51
C507	21-82428B59	34
C508L	21-84494B51	.01 uF ± 80 -20%; 200 V
C508M, H	21-84494B26	160
C509L	21-84494B38	130
C509M	21-84494B38	15
C509H	21-84494B29	15
C510L	21-84494B09	10
C510M	21-84494B01	175
C510H	21-84494B24	51
C511L	21-84494B02	39
C513L	21-84494B51	62
C513M, H	21-84494B26	160
C514	8-83813H05	130
C515H	23-83214C17	.068 uF $\pm 10\%$; 100 V
C516	23-83214C10	3.3 uF $\pm 20\%$; 15 V
C517	21-83596E10	47 uF $\pm 20\%$; 6 V
C518L	21-84494B25	220 $\pm 20\%$
C518M	21-84494B35	49
C518H	21-84494B25	60
C519L	21-84494B25	49
C519M	21-84494B35	49
C519H	21-84494B28	60
C520L	21-84936A06	43
C520M	21-84936A04	30 ± 1.5 pF; 2000 V
C520H	21-84936A03	25; 2000 V
C521L	21-84494B02	20; 2000 V
C521M, H	21-84494B28	62
C522L	21-84494B45	43
C522M	21-84494B24	56
C522H	21-84494B01	39
C523L	21-84395B03	51
C523M	21-84395B02	80; 250 V
C523H	21-84395B04	100; 250 V
C524M	21-82428B59	120; 250 V
C524H	21-82372C04	.01 uF ± 80 -20%; 200 V
C525	21-84395B02	.05 uF ± 80 -20%; 25 V
C526M	21-82428B59	100; 250 V
C526H	21-82372C04	.01 uF ± 80 -20%; 200 V
C527L	21-84494B28	.05 uF ± 80 -20%; 25 V
C527M	21-84494B43	43
C527H	21-84494B41	36
C528L	21-84494B31	24
C528M	21-84494B31	75
C528H	21-84494B03	75
C529L	21-84494B35	80
C529M, H	21-84494B01	60
C530	21-83596E10	51
C531L	21-84494B28	220 $\pm 20\%$
C531M	21-84494B43	43
C531H	21-84494B41	36
C532L	21-84494B31	24
C532M	21-84494B31	75
C532H	21-84494B03	75
C533L	21-84494B02	80
		62

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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C533M	21-84494B35	60
C533H	21-84494B34	68
C534, 535	21-83596E10	220 $\pm 20\%$
C536L	21-84494B12	220
C536M	21-84494B18	390
C537L	21-84395B05	130; 250 V
C537M	21-84395B06	150; 250 V
C537H	21-84395B02	100; 250 V
C538L	21-84395B05	130; 250 V
C538M	21-84395B06	150; 250 V
C538H	21-84395B04	120; 250 V
C541L	21-84494B12	220
C541M, H	21-84494B26	130
C542L	21-83495B05	130; 250 V
C542M	21-84395B06	150; 250 V
C542H	21-84395B02	100; 250 V
C543L	21-84395B04	120; 250 V
C543M	21-84395B05	130; 250 V
C543H	21-84395B02	100; 250 V
C546, 547	21-84426B36	1200; 300 V
C548L	21-84494B51	160
C548M, H	21-84494B26	130
C549, 550	8-83813H05	.068 uF $\pm 10\%$; 100 V
C551L	21-84494B51	160
C551M, H	21-84494B26	130
C522L	23-83210A21	15 uF -10+150%; 25 V
C552M	23-84669A19	100 uF ± 150 -10%; 20 V
C552H	23-82783B04	100 uF $\pm 20\%$; 25 V
C556L	21-84494B33	30
C556M	21-84494B33	30
C556H	21-84494B29	10
C557H	21-84494B74	6 ± 0.5 pF
	23-82783B25	4.7 uF $\pm 10\%$; 25 V
CR501	48-82139G01	SEMICONDUCTOR DEVICE, diode; (SEE NOTE)
CR502	48-82525G01	germanium silicon
J501, 502	9-84231B03	CONNECTOR, receptacle; phono
J503	9-84207B01	7-contact
L501	24-83961B01	COIL, RF; choke; 3 turns; coded BRN
L502	24-84392B03	choke; 6 turns
L503L	7-84400B03	inductor "bracket"
L503M, H	24-83884G03	1-1/2 turns
L504L, M	24-83961B03	choke; 1 turn; coded WHT
L504H	24-82723H18	choke; 85 nH
L505	24-84392B02	choke; 4 turns
L506L	24-82723H20	choke; 0.29 uH
L506M	24-82723H02	choke; 39 nH
L506H	24-82723H20	choke; 0.29 uH
L507, 508	24-84393B02	choke; 4-1/2 turns
L509L, H	24-82723H04	choke; 0.29 uH
L509M	24-82723H02	choke; 39 nH
L510M	24-82723H02	choke; 39 nH
L510L, H	24-82723H04	choke; 0.29 uH
L511, 512	24-84393B02	choke; 4-1; 2 turns
R501L	6-124C97	RESISTOR, fixed: $\pm 10\%$; 1/4 W; unless otherwise stated
R501M, H	6-124D02	100k
R502L, M	6-124A01	150k
R502H	6-124C17	10 $\pm 5\%$
R503	6-124D55	47
R504	6-124C53	2.7
R505	6-124C65	1.5k
R506	6-125D70	4.7k
R507	6-124C65	1; 1/2 W
R508	6-125D70	4.7k
R509	6-84232B01	1; 1/2 W
R511M	6-124D55	(meter shunt)
R528	6-124D55	2.7
		2.7
T501	25-84396B01	TRANSFORMER, RF; pri: 5 turns
T502	25-84397B01	sec: 4 windings, 1 turn each
		pri: 2 windings, 1-3/4 turns each
		sec: 2 windings, 1-3/4 turns each

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
T503L	24-84302C01	pri: 2 windings, 2-3/4 turns each
		sec: 2 windings, 2-3/4 turns each
T503M	24-84464D01	NOTE: ("Left-hand" windings)
		pri: 3-3/4 turns
T503H	24-82060L01	sec: 3-3/4 turns
		pri: 2 windings, 2 turns each
T504L	24-84302C02	sec: 2 windings, 2 turns each
		pri: 2 windings, 2-3/4 turns each
T504M	24-84464D01	sec: 2 windings, 2-3/4 turns each
		NOTE: ("Right-hand" windings)
T504H	24-82060L01	pri: 3-3/4 turns
		sec: 3-3/4 turns
T505L, M	25-84812B01	pri: 2 windings, 2 turns each
		sec: 2 windings, 2 turns each
T505H	25-84398B01	pri: 3 windings, 1-1/2 turns each
		sec: 6 turns
T506L, M	25-84812B01	pri: 3 windings, 1-1/2 turns each
		sec: 5 turns
T506H	25-84398B01	pri: 3 windings, 1-1/2 turns each
		sec: 5 turns
NON-REFERENCED ITEM		
	14-84266B01	INSULATOR (teflon); 2 used

Exciter Output Filter		PL-1721-O
Z501L	TFD6111A	FILTER, RF; bandpass;
Z501M, 501H	TFD6112A	132-150.8 MHz
		150.8-174 MHz

TRN6968A Hardware & Heat Sink Kit, 110 W PA		PL-5516-O
C553	21-84211B02	CAPACITOR, fixed: .01 uF; 250 V
Q501	48-869622	TRANSISTOR; (SEE NOTE)
Q502	48-869623	PNP; type M9622
Q503, 504	48-869624	PNP; type M9623
Q505 thru 508	48-869625	PNP; type M9624
		PNP; type M9625
NON-REFERENCED ITEMS		
	3-114406	SCREW, cap: 4-40 x 5/16"; 16 used
	3-134184	SCREW, tapping: 4-40 x 5/16" (w/internal lockwasher); 4 used
	3-134212	SCREW; tapping: 4-40 x 5/16" (w/external lockwasher); 8 used
	3-139000	SCREW, machine: 10-32 x 1-1/2"; 2 used
	4-115362	WASHER, lock: #10 (external tooth); 2 used
	4-801846	WASHER, insulating
	7-83269L01	BRACKET, hinge
	14-84290B02	INSULATOR, circuit board
	26-84170G02	HEAT SINK
	42-82234G01	RING, cord; 2 used

TRN8069A Resistor-Capacitor Kit (132-150.8 MHz)		PL-5502-O
C570, 572, thru 577	8-83813H05	CAPACITOR, fixed: .068 uF $\pm 10\%$; 100 V
R512, 513	6-125C25	RESISTOR, fixed: $\pm 10\%$; 1/2 W;
R516 thru 527	6-125C03	100
		12

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN6966A Transistor Control Bracket Assembly		
		PL-5500-O
C560, 561, 562	21-410115	CAPACITOR, fixed: 220 pF $\pm 20\%$; 500 V
Q509	48-869627	TRANSISTOR; (SEE NOTE) NPN; type M9627
NON-REFERENCED ITEMS		
	1-80797B32	BRACKET ASSEMBLY includes:
	7-83273L01	BRACKET, transistor mounting
	9-84935D01	SOCKET, transistor
	3-3360	SCREW, tapping: 6-20 x 1/2; 2 used
	4-7666	WASHER, lock: #6 (external tooth); 2 used
	14-82399B01	INSULATOR, transistor
	29-812979	LUG, solderless
	29-84078B01	LUG, flanged spade: 2 used
	42-10217A02	STRAP, cable harness: 4 used

TRN6445A Resistor-Capacitor Kit (150.8-162 MHz)		PL-5501-O
C570 thru 577	8-83813H05	CAPACITOR, fixed: .068 uH $\pm 10\%$; 100 V
R512 thru 515	6-125C25	RESISTOR, fixed: $\pm 10\%$; 1/2 W;
R516 thru 527	6-125C03	100
		12

TLD5502A Resistor-Capacitor (162-174 MHz)		PL-5503-O
C570 thru 577	8-83813H05	CAPACITOR, fixed: .068 uF $\pm 10\%$; 100 V
R512, 513	6-125C25	RESISTOR, fixed: 100 $\pm 10\%$; 1/2 W
R514, 515	6-125A18	51 $\pm 5\%$; 1/2 W
R516 thru 527	6-125C03	12 $\pm 10\%$; 1/2 W

90/100 W POWER AMPLIFIER BOARD

TLD 5730A SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE
TLD5732A	132-150.8 MHz
TLD5733A	150.8-162 MHz
TLD5734A	162-174 MHz

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifier boards provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

90/110 W POWER AMPLIFIER



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-Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

-Diode protection against reverse polarity voltage (board mounted diode).

-Output protection provided by a control stage transistor driven by power control circuit. (Controls gain of the first stage). In intermittent duty stations, a single-wire connection provides interconnection between power control and PA circuitry. In continuous duty stations three wire connections provide the interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband matching network and applied to the pre-driver stage. A second ferrite transformer is utilized to match the single-ended output of the pre-driver stage to the input of the push-pull driver stage. The output of the driver stage is split by a pair of transformers to drive each of the push-pull final power amplifier stages. The output from each final stage is stepped up in impedance by ferrite transformers and paralleled to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pins 3 and 4 reflect the output drive signal and operation of the two push-pull power amplifier stages. Reference position A on a Motorola Portable Test

Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board. It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in metering or a Motorola portable test set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA. All such equipment is battery operated which permits testing to be performed in the field where no commercial power is available for bench type test equipment. Option built-in station metering when incorporated takes the place of the portable test set.

(1) Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however a low impedance multimeter is acceptable for dc voltage measurements only.

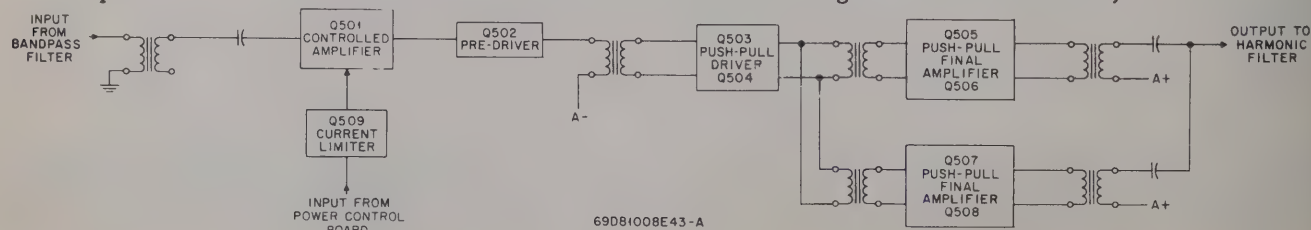


Figure 1. Block Diagram

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Test Set Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station meter kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

The optional built-in station metering is similar to the portable test set except PA voltage is measured with the two voltage probes. The built-in metering polarity switch is set to REV for PA metering and FWD for Power Control Board metering.

a. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

b. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

c. Turn the station ON.

d. With the meter selector switch set to PA position 1 and the meter plug connected to the power amplifier, key the transmitter and observe the meter. Unkey the transmitter.

Set the selector switch to position 2, 3, and 4 keying the transmitter and observing the meter reading for each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows the "Using the Portable Test Set" paragraphs.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows.

a. Set the function selector switch of the portable test set to the XMTR position.

b. Set the meter reversing switch of the test set to the METER REV position, the selector switch to position 1, and REF switch to position A.

c. Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

d. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

e. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

f. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

g. Turn the station ON.

h. Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

i. Set the selector switch to positions 2, 3, & 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for

each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be operating normally.

(b) The power control board should be known to be functioning normally.

(2) Key the transmitter and observe power out, which should be 90, 100, or 110 watts, depending upon licensing.

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	PORT. TEST SET REF. SW.	STATION METERING POL SW.	MINIMUM METER READING	CIRCUIT METERED	IF LOW, DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	REV	15 uA	Exciter Output (input to Controlled Amplifier Q501)	Exciter output, input circuitry of controlled amplifier stage Q501
2	A	REV	5 uA	Input of Pre-driver Stage (Q502)	Output of controlled amplifier stage input circuitry of predriver stage
3	A	REV	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q505, Q506	Input of Q505, Q506 stages, output of driver stage (Q502, Q503), output of predriver stage Q502
4	A	REV	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q507, Q508	Input of Q507, Q508 stage output of driver stage Q502, Q503. Output of predriver stage Q502
5	B	REV	21 uA min. — 90 W 27 uA max. — 100 W 23 uA min. — 100 W 37 uA max. — 110 W	Total Current in Final Amplifier Stages Q505, Q506, Q507, Q508	Output of final amplifier stages Q505-Q508, power control board antenna switch, antenna.
6 (Or 25 V SEE NOTE)	B	FWD	12 V (0-30 V scale on portable test set, 25 V full scale on built-in metering)	Final Amplifier Stage	Final amplifier stage A+ or A-input.

NOTE: When using optional built-in station metering, the two voltage probes are used to measure PA voltage.

(3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the radio set and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA decks, several checks can be made prior to extensive troubleshooting.

a. Visual

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for proper voltages at the collectors of each transistor. Certain defects such as broken plating, broken leads etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarize these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of P-N-P transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection of "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

The schematic diagram of the PA board contains the voltage readings required for troubleshooting. The readings are typical for normal operating conditions at rated power output for the radio. Refer to the troubleshooting chart, and the schematic when a defect is suspected in the PA board.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at both base and emitter, BOTH devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type de-soldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

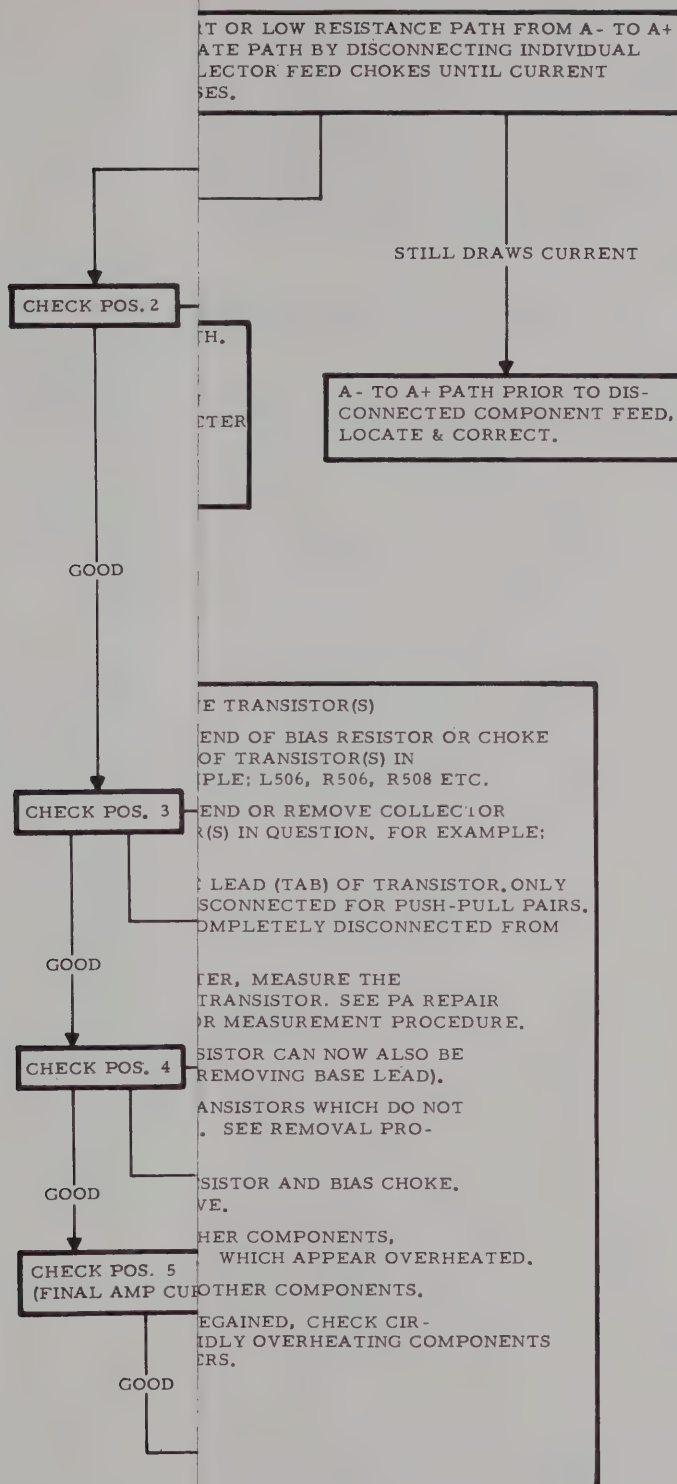
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

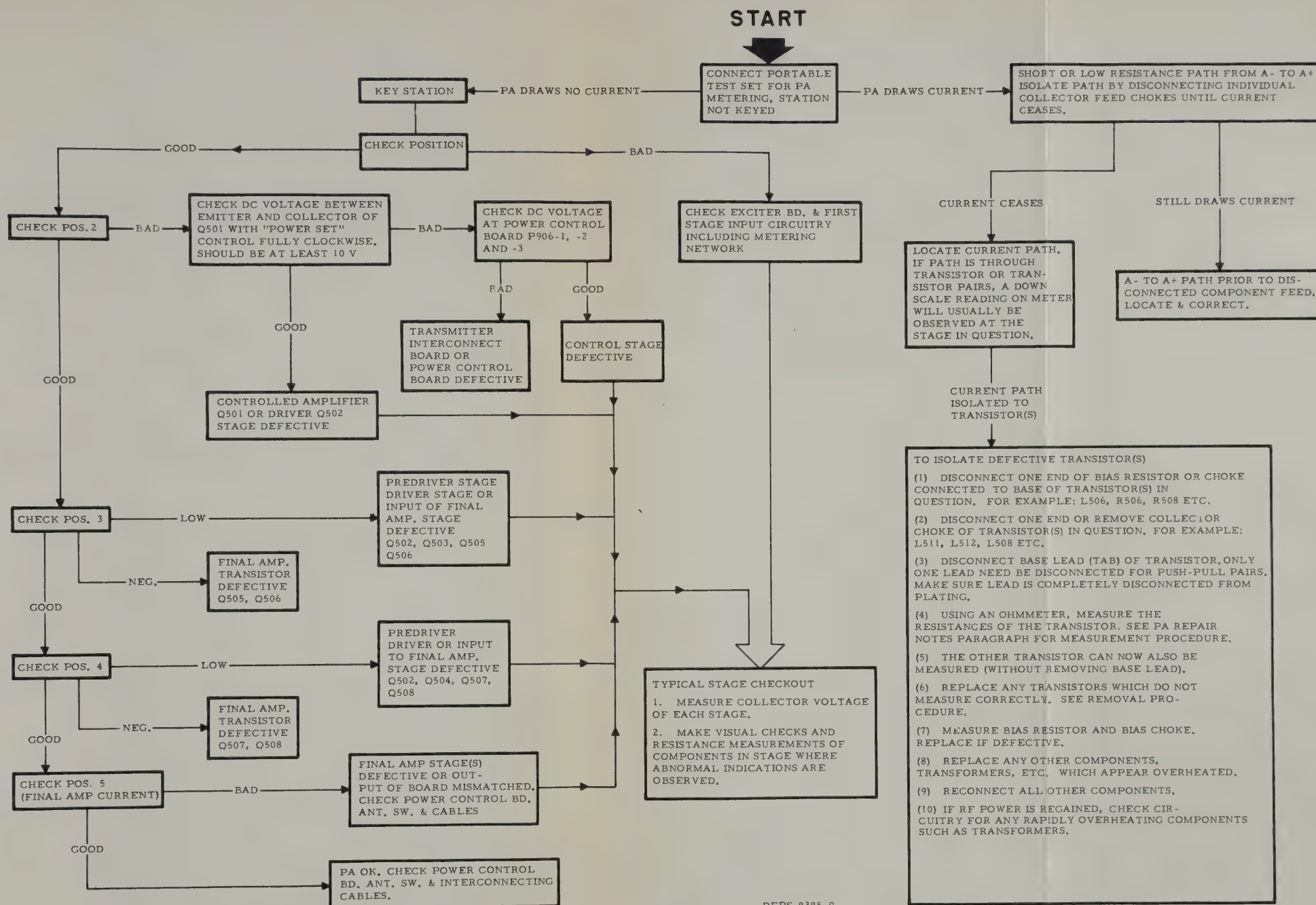
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



DEPS-8385-0

POWER AMPLIFIER ALIGNMENT PROCEDURE

PORTABLE TEST SET		OPTIONAL BUILT-IN METERING		ADJUST	STAGE AND PROCEDURE
TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER SELECTOR SWITCH	POLARITY SWITCH		
--	--	--	--	--	Align the exciter.
--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
--	--	--	--	C501, C502	PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 plates fully meshed.
Wattmeter 1	METER REV. REF A	PWR CONT 1	FWD	POWER SET	OUTPUT - Without exceeding rated power output on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA Meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
--	METER REV. REF B	PWR CONT 5	FWD	C501, C502	PA DRIVER OUTPUT - Tune C501, then C502, for minimum meter 5 reading.
Wattmeter 1	METER REV. REF A METER REV. REF B	PWR CONT 1 PWR CONT 5	FWD FWD	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 4 and 5). Check meter reading, it must not exceed 50 uA.
--	METER REV. REF B	PWR AMP 5	REV	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 25 A. Therefore, to measure the final collector current (I_C) in amperes, take 1/2 the meter reading.
--	METER REV. REF B	25 V (Use voltage probes)	FWD	--	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_C). V_C is the meter 6 reading (0-30 V scale on portable test set, 25 V full scale on built-in metering).
--	--	--	--	--	Determine final input power (P_{in}). P_{in} equals $V_C \times I_C$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

NOTE
Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage -- polarity is automatically reversed as required when built-in station metering is used.

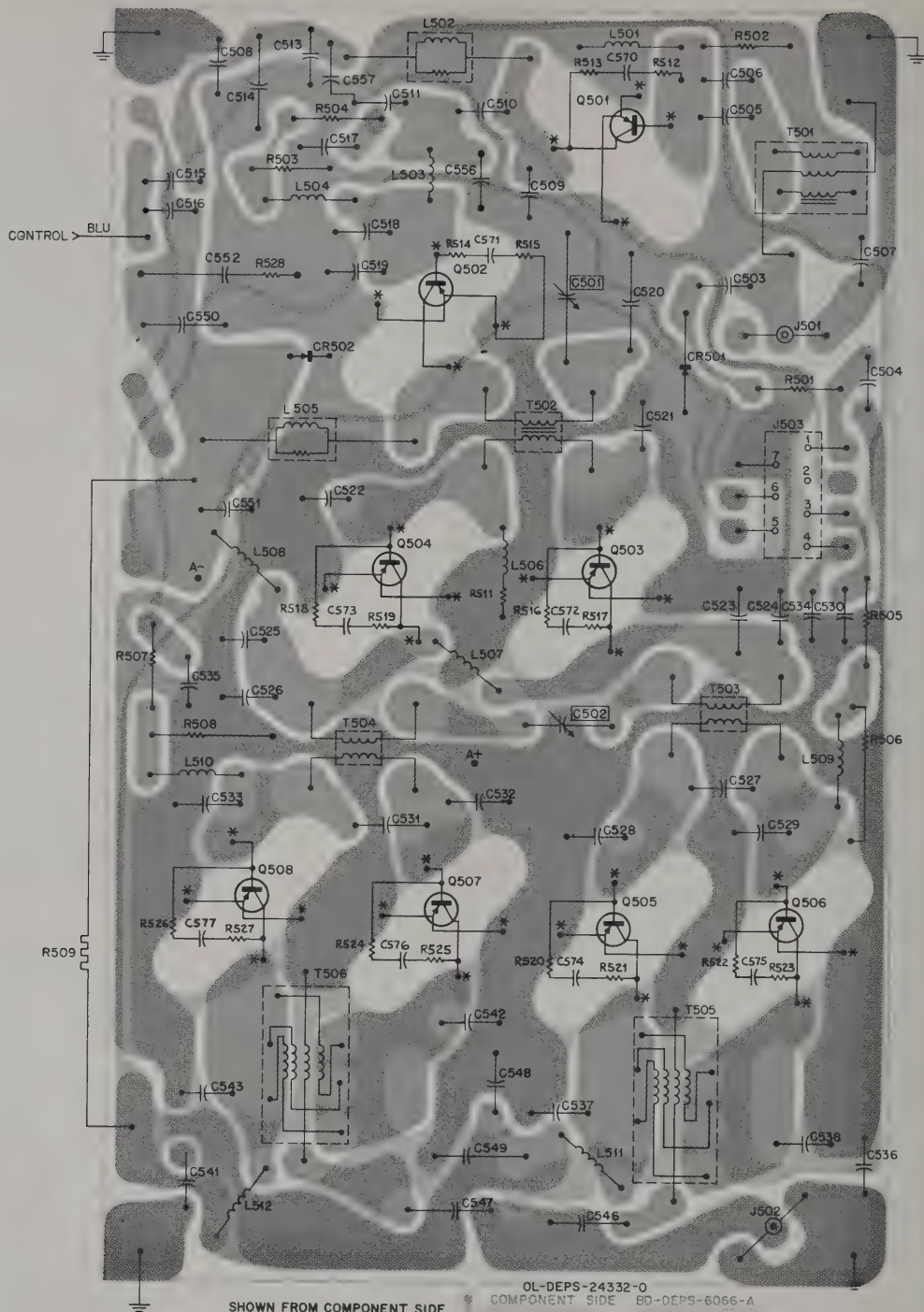
EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

- 1. Radio transmitters may be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
- 2. The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization. This power input shall be measured and the results recorded:
 - a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter which may increase the power input.
 - c. At intervals not to exceed one year.
- 3. Frequency and deviation of a transmitter must be checked:
 - a. When it is initially installed.
 - b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - c. At intervals not to exceed one year.

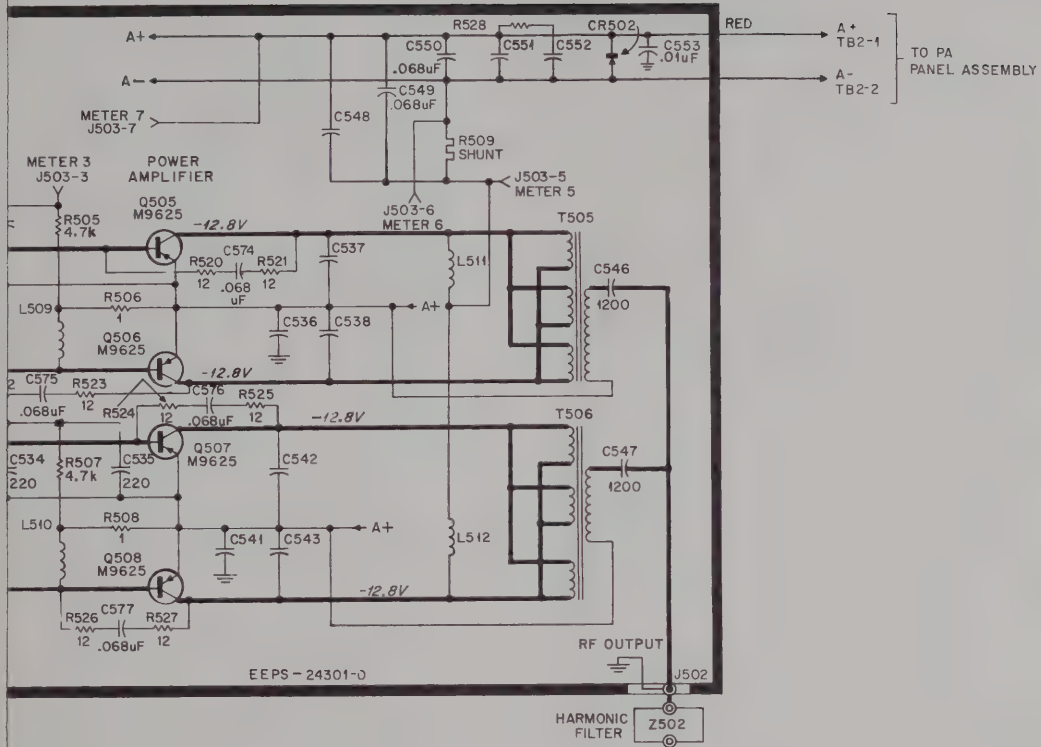
POWER AMPLIFIER ALIGNMENT PROCEDURE

STEP	METERING PLUG LOCATION	PORTABLE TEST SET		OPTIONAL BUILT-IN METERING		ADJUST	STAGE AND PROCEDURE
		TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER SELECTOR SWITCH	POLARITY SWITCH		
1	--	--	--	--	--	--	Align the exciter.
2	--	--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
3	--	--	--	--	--	C501, C502	PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 plates fully meshed.
4	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A	PWR CONT 1	FWD	POWER SET	OUTPUT - Without exceeding rated power output on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA Meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
5	POWER CONTROL BOARD	5	METER REV. REF B	PWR CONT 5	FWD	C501, C502	PA DRIVER OUTPUT - Tune C501, then C502, for minimum meter 5 reading.
6	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A METER REV. REF B	PWR CONT 1 PWR CONT 5	FWD FWD	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 4 and 5). Check meter reading, it must not exceed 50 uA.
7	PA	5	METER REV. REF B	PWR AMP 5	REV	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 25 A. Therefore, to measure the final collector current (I _c) in amperes, take 1/2 the meter reading.
8	PA	6	METER REV. REF B	25 V (Use voltage probes)	FWD	--	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V _c). V _c is the meter 6 reading (0-30 V scale on portable test set, 25 V full scale on built-in metering).
9	--	--	--	--	--	--	Determine final input power (P _{in}). P _{in} equals V _c x I _c . P _{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

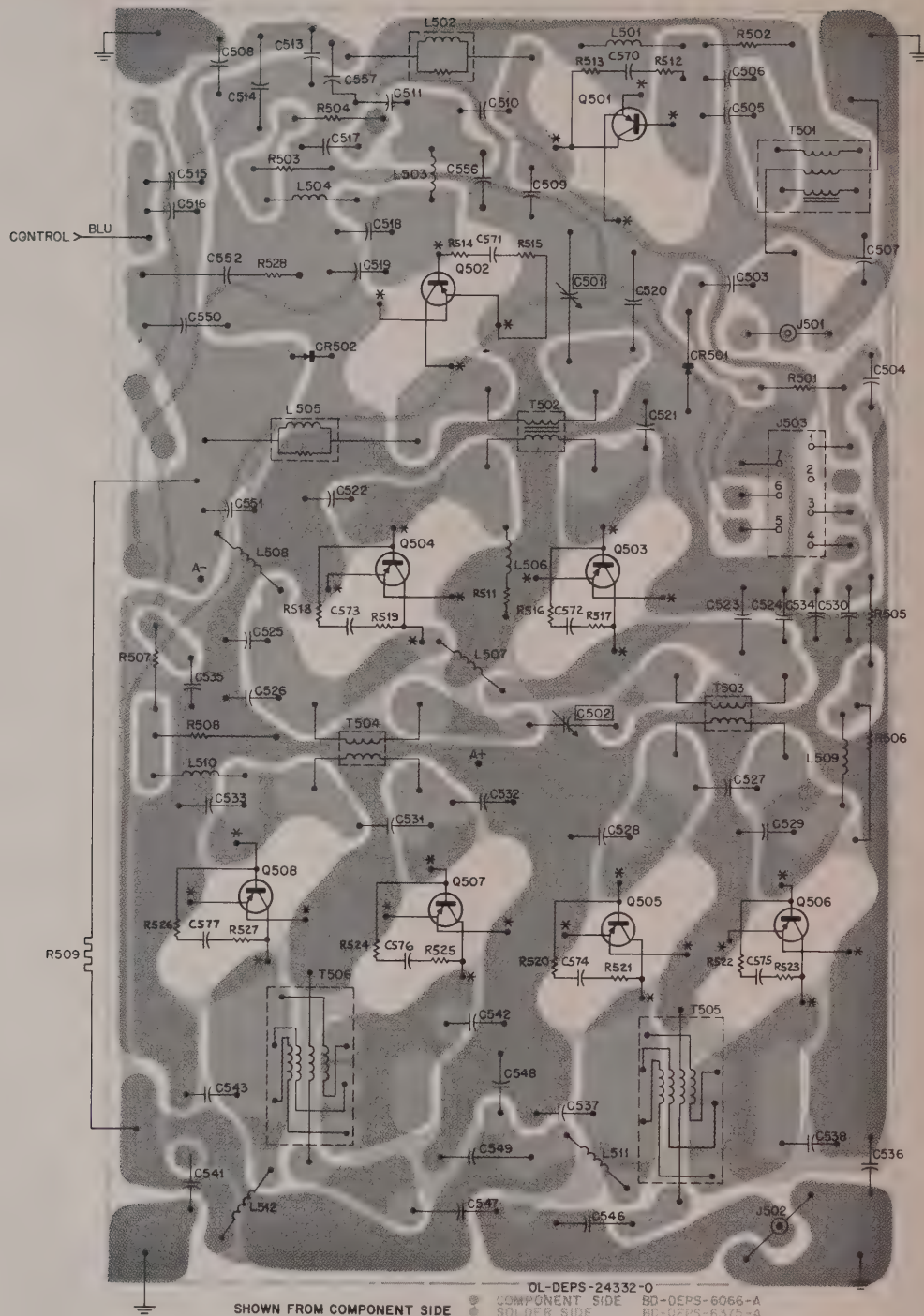


* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD

90/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-24462-O
6/20/80-PHI



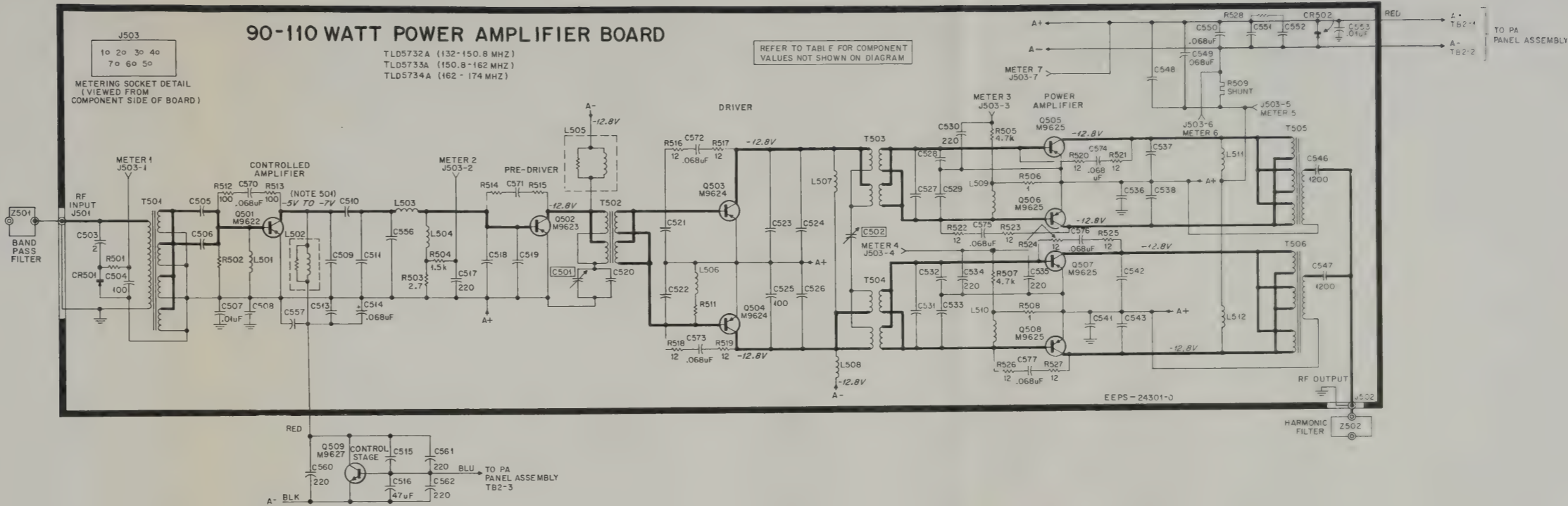
PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
90/110 W Power Amplifier
Schematic Diagram
Motorola No. 63P81036E15-O
6/20/80-PHI



90/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-24462-O
6/20/80-PHI

PA COMPONENT VALUES			
REF SYMBOL	132-150.8 MHz	150.8-162 MHz	162-174 MHz
C501	4-40	1.5-18	1.5-18
C502	2.4-27	2-19.3	2-19.3
C505	62	49	62
C506	62	51	34
C508	160	130	130
C509	15	15	10
C510	175	51	39
C511	62	NOT USED	NOT USED
C513	160	130	130
C515	NOT USED	NOT USED	3.3 uF
C518	49	60	49
C519	49	60	43
C520	30	25	20
C521	62	43	43
C522	56	39	51
C523	80	100	120
C524	NOT USED	.01 uF	.05 uF
C526	NOT USED	.01 uF	.05 uF
C527	43	36	24
C528	75	75	80
C529	60	51	51
C531	43	36	24
C532	75	75	80
C533	62	60	68
C536	220	390	NOT USED
C537	130	150	100
C538	130	150	120
C541	220	130	130
C542	130	150	100
C543	120	130	100
C548	160	130	130
C551	160	130	130
C552	15 uF	100 uF	100 uF
C556	30	10	6
C557	NOT USED	NOT USED	4.7 uF
C571	NOT USED	.068 uF	.068 uF
L503	7-84400B03	1-1/2 TURNS	1-1/2 TURNS
L504	1 TURN	1 TURN	85 nH
L506	.29 uH	39 nH	.29 uH
L509	.29 uH	39 nH	.29 uH
L510	.29 uH	39 nH	.29 uH
R501	100k	150k	150k
R502	10	10	47
R511	NOT USED	2.7	NOT USED
R514	NOT USED	100	51
R515	NOT USED	100	51
R528	NOT USED	NOT USED	2.7
T503	24-84302C01	24-84464D01	24-82060L01
T504	24-84302C02	24-84464D01	24-82060L01
T505	25-84812B01	24-84812B01	25-84398B01
T506	25-84812B01	24-84812B01	25-84398B01

EPS-24303-O



POWER AMPLIFIER

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED:
CAPACITOR VALUES ARE IN PICOFARADS.

EPS-24302-O

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
90/110 W Power Amplifier
Schematic Diagram
Motorola No. 63P81036E15-O
6/20/80-PHI

LA O	DESCRIPTION
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ontrol

PL-5500-O

5	<u>CAPACITOR, fixed:</u> 220 pF $\pm 20\%$; 500 V
27	<u>TRANSISTOR: (SEE NOTE)</u> NPN; type M9627
FERENCED ITEMS	
332	BRACKET ASSEMBLY includes:
L01	BRACKET, transistor mounting
D01	SOCKET, transistor
	SCREW, tapping: 6-20 x 1/2; 2 used
	WASHER, lock: #6 (external tooth); 2 used
9B01	INSULATOR, transistor
79	LUG, solderless
8B01	LUG, flanged spade; 2 used
7A02	STRAP, cable harness: 4 used

citor Kit

PL-5501-O

05	<u>CAPACITOR, fixed:</u> .068 uH $\pm 10\%$; 100 V
	<u>RESISTOR, fixed: $\pm 10\%$; 1/2 W:</u> 100 12

citor

PL-5503-O

05	<u>CAPACITOR, fixed:</u> .068 uF $\pm 10\%$; 100 V
	<u>RESISTOR, fixed:</u> 100 $\pm 10\%$; 1/2 W 51 $\pm 5\%$; 1/2 W 12 $\pm 10\%$; 1/2 W

90/100/110 W POWER AMPLIFIER

MODEL CHART

TLD1682B	132-150.8 MHz	INTERMITTENT DUTY
TLD1683C	150.8-162 MHz	
TLD1684C	162-174 MHz	
TLD1692D	132-150.8 MHz	CONTINUOUS DUTY
TLD1693E	150.8-162 MHz	
TLD1694E	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifiers provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

90/100/110 W POWER AMPLIFIER



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
LEGEND: L = 132-150.8 MHz M = 150.8-162 MHz H = 162-174 MHz TLD5732A Power Amplifier Board (132-150.8 MHz) TLD5733A Power Amplifier Board (150.8-162 MHz) TLD5734A Power Amplifier Board (162-174 MHz) PL-5504-O		
NOTE This parts list covers more than one model. Where differences exist a letter code is added to the reference symbol to indicate the applicable unit.		
C501L C501M, 501H C502L C502M, H C503 C504 C505L C505M C505H C506L C506M C506H C507 C508L C508M, H C509L C509M C509H C510L C510M C510H C511L C513L C513M, H C514 C515H C516 C517 C518L C518M C518H C519L C519M C519H C520L C520M C520H C521L C521M, H C522L C522M C522H C523L C523M C523H C524M C524H C525 C526M C526H C527L C527M C527H C528L C528M C528H C529L C529M, H C530 C531L C531M C531H C532L C532M C532H C533L	20-83201B09 20-83201B07 19-83491E08 19-83491E07 21-83406D52 21-84494B04 21-84494B02 21-84494B25 21-84494B02 21-84494B02 21-84494B01 21-84494B30 21-82428B59 21-84494B51 21-84494B26 21-84494B38 21-84494B38 21-84494B29 21-84494B09 21-84494B01 21-84494B24 21-84494B02 21-84494B51 21-84494B26 8-83813H05 23-83214C17 23-83214C10 21-83596E10 21-84494B25 21-84494B35 21-84494B25 21-84494B25 21-84494B35 21-84494B28 21-84936A06 21-84936A04 21-84936A03 21-84494B02 21-84494B28 21-84494B45 21-84494B24 21-84494B01 21-84395B03 21-84395B02 21-84395B04 21-82428B59 21-82372C04 21-84395B02 21-82428B59 21-82372C04 21-84494B28 21-84494B43 21-84494B41 21-84494B31 21-84494B31 21-84494B03 21-84494B35 21-84494B01 21-83596E10 21-84494B28 21-84494B43 21-84494B41 21-84494B31 21-84494B31 21-84494B03 21-84494B02	CAPACITOR, fixed: pF; ±5%; 500 V; unless otherwise stated variable; 4-40; 100 V variable; 1.5-18; 100 V variable; 2.4-27 variable; 2-19.3 2 ±0.25 pF 100 62 49 62 62 51 34 .01 uF +80-20%; 200 V 160 130 15 15 10 175 51 39 62 160 130 .068 uF ±10%; 100 V 3.3 uF ±20%; 15 V 47 uF ±20%; 6 V 220 ±20% 49 60 49 49 60 43 30 ±1.5 pF; 2000 V 25; 2000 V 20; 2000 V 62 43 56 39 51 80; 250 V 100; 250 V 120; 250 V .01 uF +80-20%; 200 V .05 uF +80-20%; 25 V 100; 250 V .01 uF +80-20%; 200 V .05 uF +80-20%; 25 V 43 36 24 75 75 80 60 51 220 ±20% 43 36 24 75 75 80 62

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C533M C533H C534, 535 C536L C536M C537L C537M C537H C538L C538M C538H C541L C541M, H C542L C542M C542H C543L C543M C543H C546, 547 C548L C548M, H C549, 550 C551L C551M, H C522L C552M C552H C556L C556L C556M C556H C557H CR501 CR502 J501, 502 J503 L501 L502 L503L L503M, H L504L, M L504H L505 L506L L506M L506H L507, 508 L509L, H L509M L510M L510L, H L511, 512 R501L R501M, H R502L, M R502H R503 R504 R505 R506 R507 R508 R509 R511M R528 T501 T502	21-84494B35 21-84494B34 21-83596E10 21-84494B12 21-84494B18 21-84395B05 21-84395B06 21-84395B02 21-84395B05 21-84395B06 21-84395B04 21-84494B12 21-84494B26 21-83495B05 21-84395B06 21-84395B02 21-84395B04 21-84395B05 21-84395B02 21-84426B36 21-84494B51 21-84494B26 8-83813H05 21-84494B51 21-84494B26 23-83210A21 23-84669A19 23-82783B04 21-84494B33 21-84494B33 21-84494B29 21-84494B74 23-82783B25 48-82139G01 48-82525G01 9-84231B03 9-84207B01 24-83961B01 24-84392B03 7-84400B03 24-83884G03 24-83961B03 24-82723H18 24-84392B02 24-82723H20 24-82723H02 24-82723H20 24-84393B02 24-82723H04 24-82723H02 24-82723H02 24-82723H04 24-82723H04 24-84393B02 6-124C97 6-124D02 6-124A01 6-124C17 6-124D55 6-124C53 6-124C65 6-125D70 6-124C65 6-125D70 6-84232B01 6-124D55 6-124D55 25-84396B01 25-84397B01	60 68 220 ±20% 220 390 130; 250 V 150; 250 V 100; 250 V 130; 250 V 150; 250 V 120; 250 V 220 130 130; 250 V 150; 250 V 100; 250 V 120; 250 V 100; 250 V 130; 250 V 100; 250 V 1200; 300 V 160 130 .068 uF ±10%; 100 V 160 130 15 uF -10+150%; 25 V 100 uF +150-10%; 20 V 100 uF ±20%; 25 V 30 30 10 6 ±0.5 pF 4.7 uF ±10%; 25 V SEMICONDUCTOR DEVICE, diode: (SEE NOTE) germanium silicon CONNECTOR, receptacle: phono 7-contact COIL, RF: choke; 3 turns; coded BRN choke; 6 turns inductor "bracket" 1-1/2 turns choke; 1 turn; coded WHT choke; 85 nH choke; 4 turns choke; 0.29 uH choke; 39 nH choke; 0.29 uH choke; 4-1/2 turns choke; 0.29 uH choke; 39 nH choke; 39 nH choke; 0.29 uH choke; 4-1/2 turns choke; 0.29 uH choke; 39 nH choke; 0.29 uH choke; 4-1/2 turns RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated 100k 150k 10 ±5% 47 2.7 1.5k 4.7k 1; 1/2 W 4.7k 1; 1/2 W (meter shunt) 2.7 2.7 TRANSFORMER, RF: pri: 5 turns sec: 4 windings, 1 turn each pri: 2 windings, 1-3/4 turns each sec: 2 windings, 1-3/4 turns each

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
T503L T503M T503H T504L T504M T504H T505L, M T505H T506L, M T506H	24-84302C01 24-84464D01 24-82060L01 24-84302C02 24-84464D01 24-82060L01 25-84812B01 25-84398B01 25-84812B01 25-84398B01	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each NOTE: ("Lefthand" windings) pri: 3-3/4 turns sec: 3-3/4 turns pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each NOTE: ("Righthand" windings) pri: 3-3/4 turns sec: 3-3/4 turns pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each pri: 3 windings, 1-1/2 turns each sec: 6 turns pri: 3 windings, 1-1/2 turns each sec: 5 turns pri: 3 windings, 1-1/2 turns each sec: 6 turns pri: 3 windings, 1-1/2 turns each sec: 5 turns NON-REFERENCED ITEM 14-84266B01 INSULATOR (teflon); 2 used Exciter Output Filter PL-1721-O Z501L Z501M, 501H TFD6111A TFD6112A FILTER, RF: bandpass; 132-150.8 MHz 150.8-174 MHz TRN6968A Hardware & Heat Sink Kit, 110 W PA PL-5516-O C553 Q501 Q502 Q503, 504 Q505 thru 508 21-84211B02 48-869622 48-869623 48-869624 48-869625 CAPACITOR, fixed: .01 uF; 250 V TRANSISTOR: (SEE NOTE) PNP; type M9622 PNP; type M9623 PNP; type M9624 PNP; type M9625 NON-REFERENCED ITEMS 3-114406 3-134184 3-134212 3-139000 4-115362 4-801846 7-83269L01 14-84290B02 26-84170G02 42-82234G01 SCREW, cap: 4-40 x 5/16"; 16 used SCREW, tapping: 4-40 x 5/16" (w/internal lockwasher); 4 used SCREW; tapping: 4-40 x 5/16" (w/external lockwasher); 8 used SCREW, machine: 10-32 x 1-1/2"; 2 used WASHER, lock: #10 (external tooth); 2 used WASHER, insulating BRACKET, hinge INSULATOR, circuit board HEAT SINK RING, cord; 2 used TRN8069A Resistor-Capacitor Kit (132-150.8 MHz) PL-5502-O C570, 572, thru 577 R512, 513 R516 thru 527 8-83813H05 6-125C25 6-125C03 CAPACITOR, fixed: .068 uF ±10%; 100 V RESISTOR, fixed: ±10%; 1/2 W; 100 12

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN6966A Transistor Cntrl Bracket Assembly PL-5500-O		
C560, 561, 562 Q509	21-410115 48-869627	CAPACITOR, fixed: 220 pF ±20%; 500 V TRANSISTOR: (SEE NOTE) NPN; type M9627
NON-REFERENCED ITEMS		
	1-80797B32 7-83273L01 9-84935D01 3-3360 4-7666 14-82399B01 29-812979 29-84078B01 42-10217A02	BRACKET ASSEMBLY includes: BRACKET, transistor mounting SOCKET, transistor SCREW, tapping: 6-20 x 1/2; 2 used WASHER, lock: #6 (external tooth); 2 used INSULATOR, transistor LUG, solderless LUG, flanged spade: 2 used STRAP, cable harness: 4 used
TRN6445A Resistor-Capacitor Kit (150.8-162 MHz) PL-5501-O		
C570 thru 577 R512 thru 515 R516 thru 527	8-83813H05 6-125C25 6-125C03	CAPACITOR, fixed: .068 uH ±10%; 100 V RESISTOR, fixed: ±10%; 1/2 W; 100 12
TLD5502A Resistor-Capacitor (162-174 MHz) PL-5503-O		
C570 thru 577 R512, 513 R514, 515 R516 thru 527	8-83813H05 6-125C25 6-125A18 6-125C03	CAPACITOR, fixed: .068 uF ±10%; 100 V RESISTOR, fixed: 100 ±10%; 1/2 W 51 ±5%; 1/2 W 12 ±10%; 1/2 W

90/100/110 W POWER AMPLIFIER

MODEL CHART

TLD1682B	132-150.8 MHz	INTERMITTENT DUTY
TLD1683C	150.8-162 MHz	
TLD1684C	162-174 MHz	
TLD1692D	132-150.8 MHz	CONTINUOUS DUTY
TLD1693E	150.8-162 MHz	
TLD1694E	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifiers provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

90/100/110 W POWER AMPLIFIER

-Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

-Diode protection against reverse polarity voltage (board mounted diode).

-Output protection provided by a control stage transistor driven by power control circuit. (Controls gain of the first stage). In intermittent duty stations, a single-wire connection provides interconnection between power control and PA circuitry. In continuous duty stations three wire connections provide the interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband matching network and applied to the pre-driver stage. A second ferrite transformer is utilized to match the single-ended output of the pre-driver stage to the input of the push-pull driver stage. The output of the driver stage is split by a pair of transformers to drive each of the push-pull final power amplifier stages. The output from each final stage is stepped up in impedance by ferrite transformers and paralleled to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pins 3 and 4 reflect the output drive signal and operation of the two push-pull power amplifier stages. Reference position A on a Motorola Portable Test

Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board. It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in metering or a Motorola portable test set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

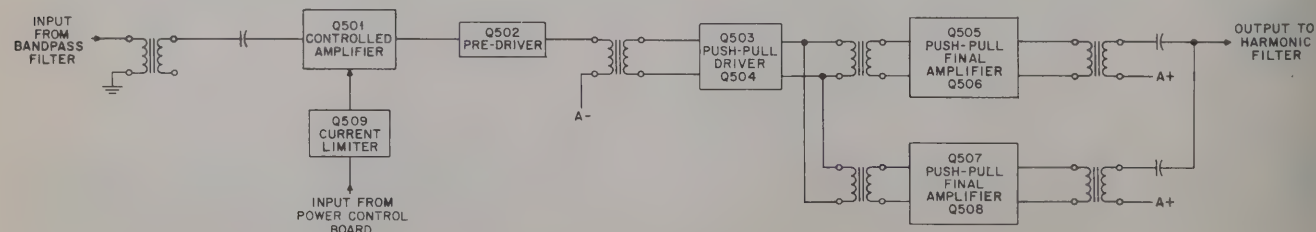
The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA. All such equipment is battery operated which permits testing to be performed in the field where no commercial power is available for bench type test equipment. Option built-in station metering when incorporated takes the place of the portable test set.

(1) Motorola SI056B through SI059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however a low impedance multimeter is acceptable for dc voltage measurements only.



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Figure 1. Block Diagram

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Test Set Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station meter kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

This procedure is valid only with intermittent duty station. Continuous duty stations with built-in station metering measure only exciter output (PA input), PA current, and PA voltage.

a. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

b. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

c. Turn the station ON.

d. With the meter selector switch set to position 1, key the transmitter and observe the meter. Unkey the transmitter.

Set the selector switch to position 2, 3, and 4 keying the transmitter and observing the meter reading for each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows the "Using the Portable Test Set" paragraphs.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows.

a. Set the function selector switch of the portable test set to the XMTR position.

b. Set the meter reversing switch of the test set to the METER REV position, the selector switch to position 1, and REF switch to position A.

c. Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

d. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

e. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

f. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

g. Turn the station ON.

h. Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

i. Set the selector switch to positions 2, 3, & 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for

each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be operating normally.

(b) The power control board should be known to be functioning normally.

(2) Key the transmitter and observe power out, which should be 90, 100, or 110 watts, depending upon licensing.

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION PORTABLE TEST SET ONLY	MINIMUM METER READINGS	CIRCUIT METERED	IF LOW, DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	15 uA	Exciter Output (input to Controlled Amplifier Q501)	Exciter output, input circuitry of controlled amplifier stage Q501
2	A	5 uA	Input of Pre-driver Stage (Q502)	Output of controlled amplifier stage input circuitry of predriver stage
3	A	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q505, Q506	Input of Q505, Q506 stages, output of driver stage (Q502, Q503), output of predriver stage Q502
4	A	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q507, Q508	Input of Q507, Q508 stage output of driver stage Q502, Q503. Output of predriver stage Q502
5 (or 2 SEE NOTE)	B	21 uA min. } 90 W 27 uA max. } 23 uA min. } 100 W 37 uA max. } 110 W	Total Current in Final Amplifier Stages Q505, Q506, Q507, Q508	Output of final amplifier stages Q505-Q508, power control board antenna switch, antenna.
6 (or 3 SEE NOTE)	B	12 V (0-30 V scale)	Final Amplifier Stage	Final amplifier stage A+ or A-input

NOTE

When optional built-in station metering is used in continuous duty stations, only exciter output (PA input), final PA current, and final PA voltage may be checked. Selector switch position functions change to:

SELECTOR SWITCH POSITION	FUNCTION METERED
1	PA input
2	PA current
3	PA voltage
4	Forward power monitor
5	Reflected power monitor
6	Control voltage

- (3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the radio set and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA decks, several checks can be made prior to extensive troubleshooting.

a. Visual

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for proper voltages at the collectors of each transistor. Certain defects such as broken plating, broken leads etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarize these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of P-N-P transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection of "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

The schematic diagram of the PA board contains the voltage readings required for troubleshooting. The readings are typical for normal operating conditions at rated power output for the radio. Refer to the troubleshooting chart, and the schematic when a defect is suspected in the PA board.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at both base and emitter,

BOTH devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type de-soldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

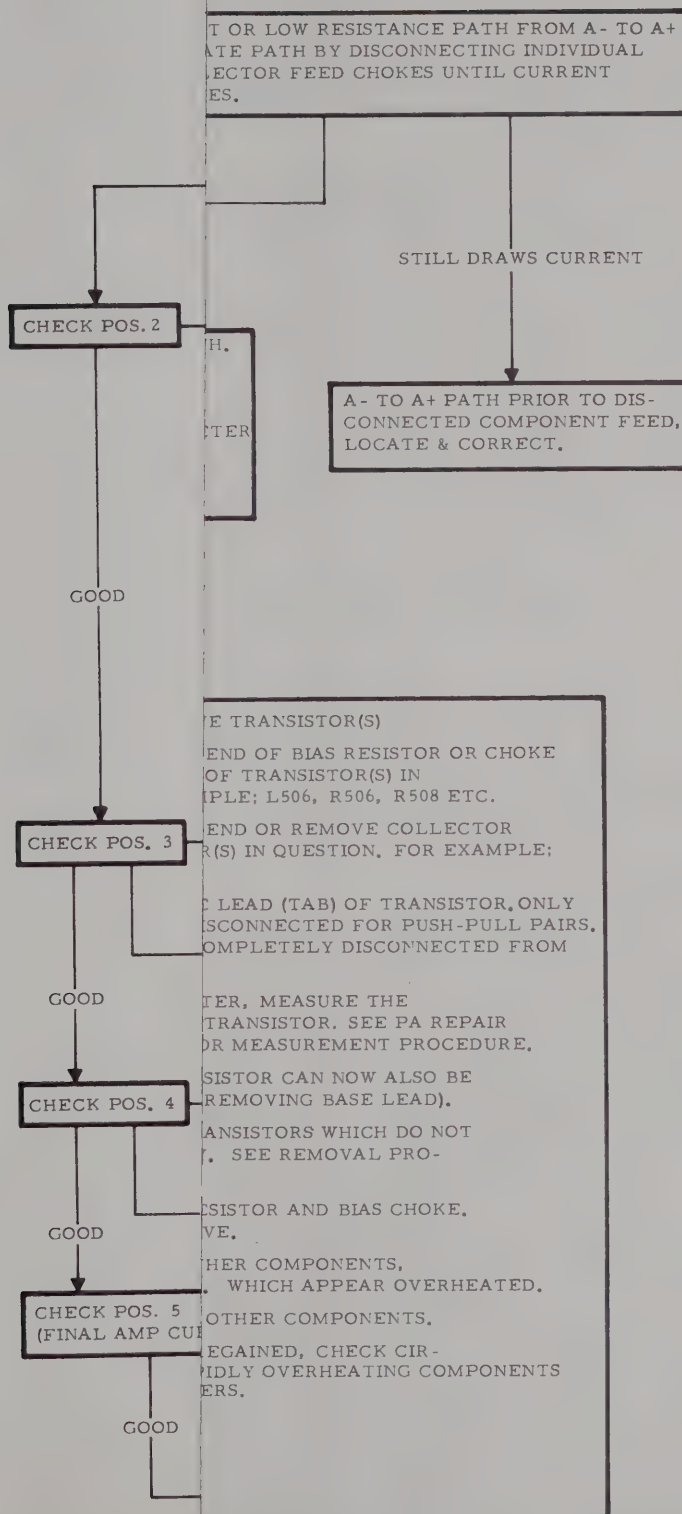
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



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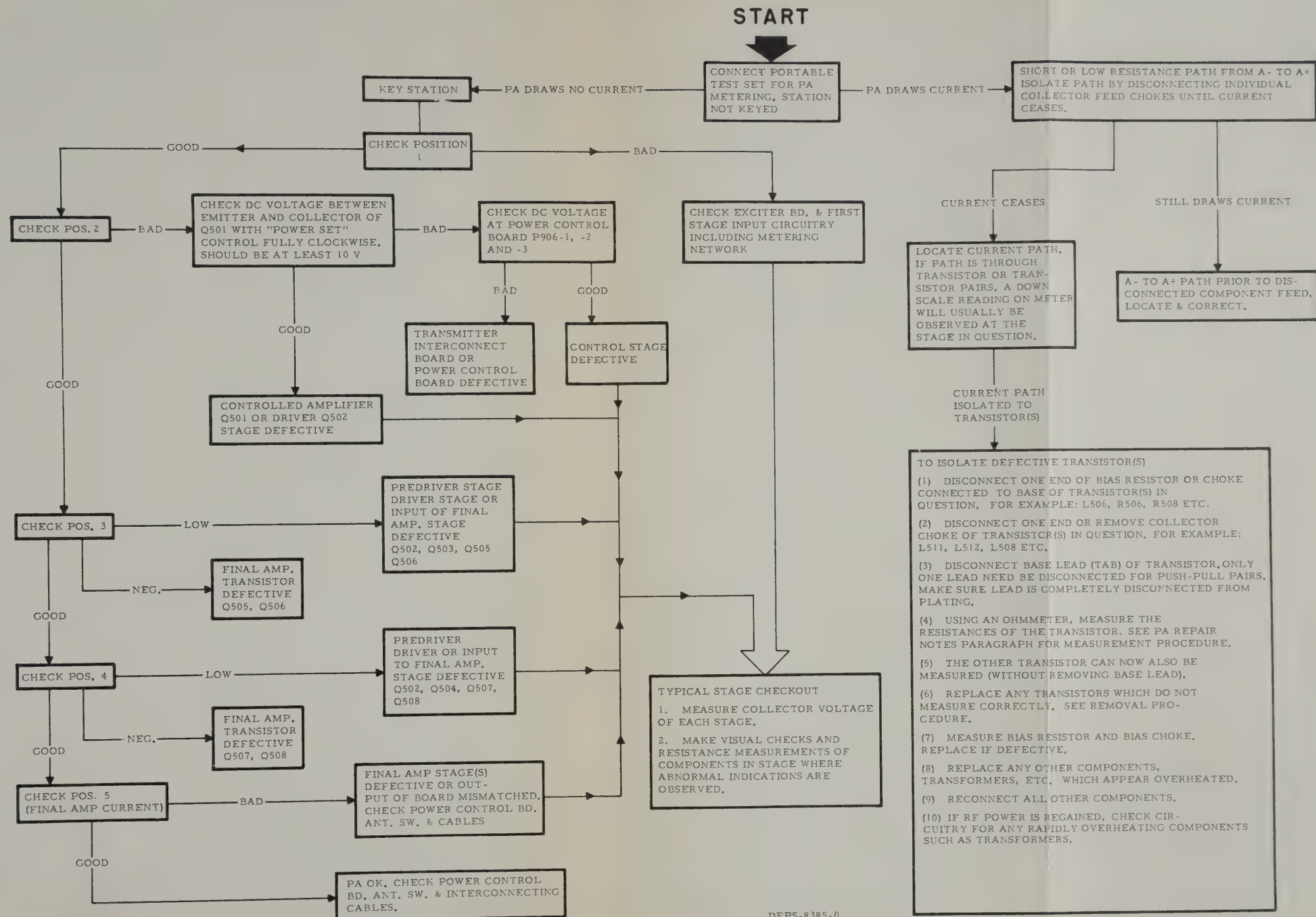
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(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.

PA TROUBLESHOOTING CHART



DEPS-8385-0

POWER AMPLIFIER ALIGNMENT PROCEDURE (CONT'D)

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
5	C501; C502	POWER CONTROL BOARD	5	METER REV. REF B	PA DRIVER OUTPUT - Tune C501, then C502 for a minimum meter 5 reading.
6	POWER SET	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A	OUTPUT - Adjust the POWER SET control for rated power output and perform step 5. (If rated power cannot be attained, repeat steps 4 and 5.)
			5	METER REV. REF B	Check meter 5 reading, it must not exceed 50 uA.
7		PA	5	METER REV. REF B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (I_c). I_c in amperes is the meter 5 reading (0-50) x 1/2.
8		PA	6	METER REV. REF B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_c). V_c is the meter 6 reading (0-30 volt scale).
9					Determine final input power (P_{in}). P_{in} equals $V_c \times I_c$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

NOTE

Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage - - polarity is automatically reversed as required when built-in station metering is used.

EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

1. Radio transmitters shall be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
2. The rf power output of a transmitter shall be no more than required for satisfactory technical operation considering area covered and local conditions. This power should be measured and the results recorded for future reference:
 - a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter which may increase the power input.
 - c. At intervals of one year (to determine system performance).
3. Frequency and deviation of a transmitter should be checked:
 - a. When it is initially installed.
 - b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - c. At intervals of one year (adjust if necessary).

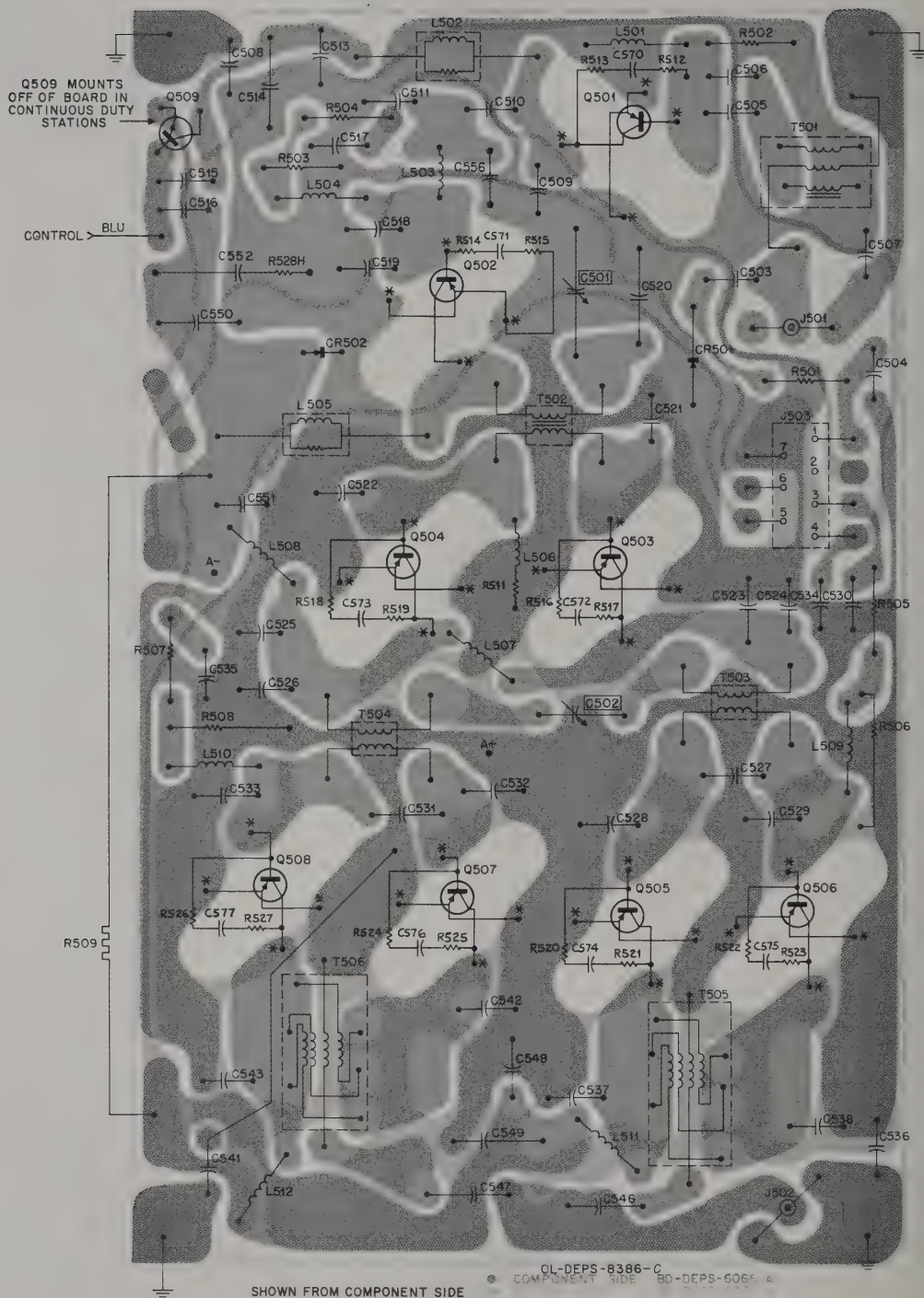
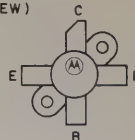
POWER AMPLIFIER ALIGNMENT PROCEDURE

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
1					Align the exciter.
2					For complete power amplifier tune-up, proceed with step 3. To check alignment move metering plug to power control board and go to step 6.
3	C501, C502				PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 to maximum capacity (plate fully meshed).
4	POWER SET	POWER CONTROL BOARD	Wattmeter or 1 AND METER REV. REF B	METER REV. REF A	OUTPUT-Move the metering plug to the power control board. Without exceeding rated power output of 90, 100, or 110 watts on the wattmeter or calibration label value on meter 1, adjust the POWERSET control for rated power or until no further increase in power output is observed. If meter 5 reads 15-25 uA, go to step 5. If meter 5 reads above 25 uA, then adjust the POWER SET control counterclockwise until meter 5 is between 15-25 uA.

POWER AMPLIFIER ALIGNMENT PROCEDURE (CONT'D)

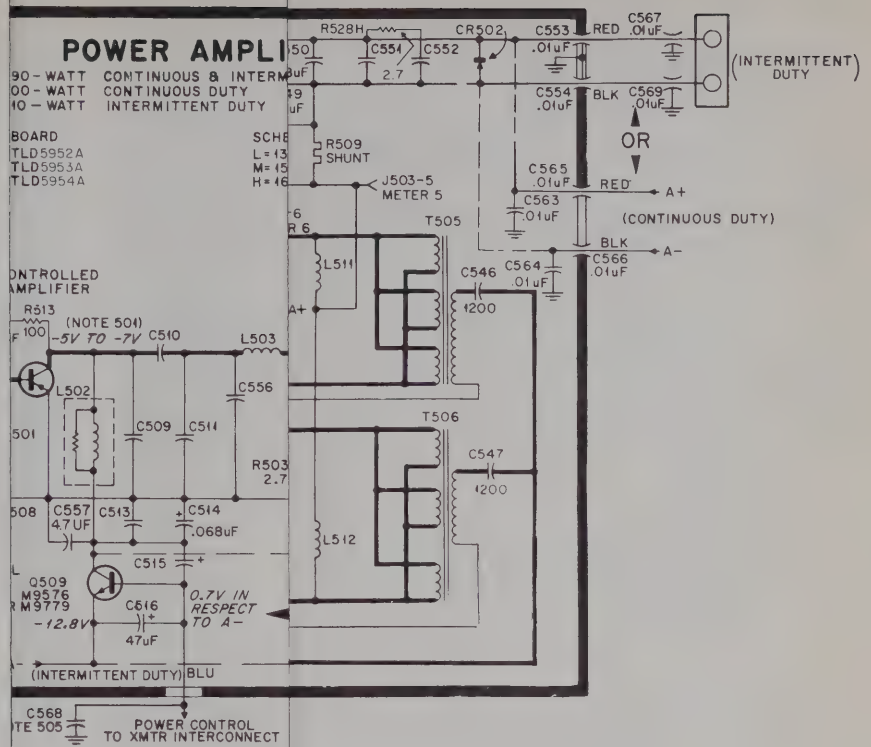
STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
5	C501, C502	POWER CONTROL BOARD	5	METER REV. REF B	PA DRIVER OUTPUT - Tune C501, then C502 for a minimum meter 5 reading.
6	POWER SET	POWER CONTROL BOARD	Wattmeter or 1 5	METER REV. REF A METER REV. REF B	OUTPUT - Adjust the POWER SET control for rated power output and perform step 5. (If rated power cannot be attained, repeat steps 4 and 5.) Check meter 5 reading, it must not exceed 50 uA.
7		PA	5	METER REV. REF B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (I_C). I_C in amperes is the meter 5 reading $(0-50) \times 1/2$.
8		PA	6	METER REV. REF B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_C). V_C is the meter 6 reading $(0-30 \text{ volt scale})$.
9					Determine final input power (P_{in}). P_{in} equals $V_C \times I_C$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

TRANSISTOR DETAILS
(TOP VIEW)



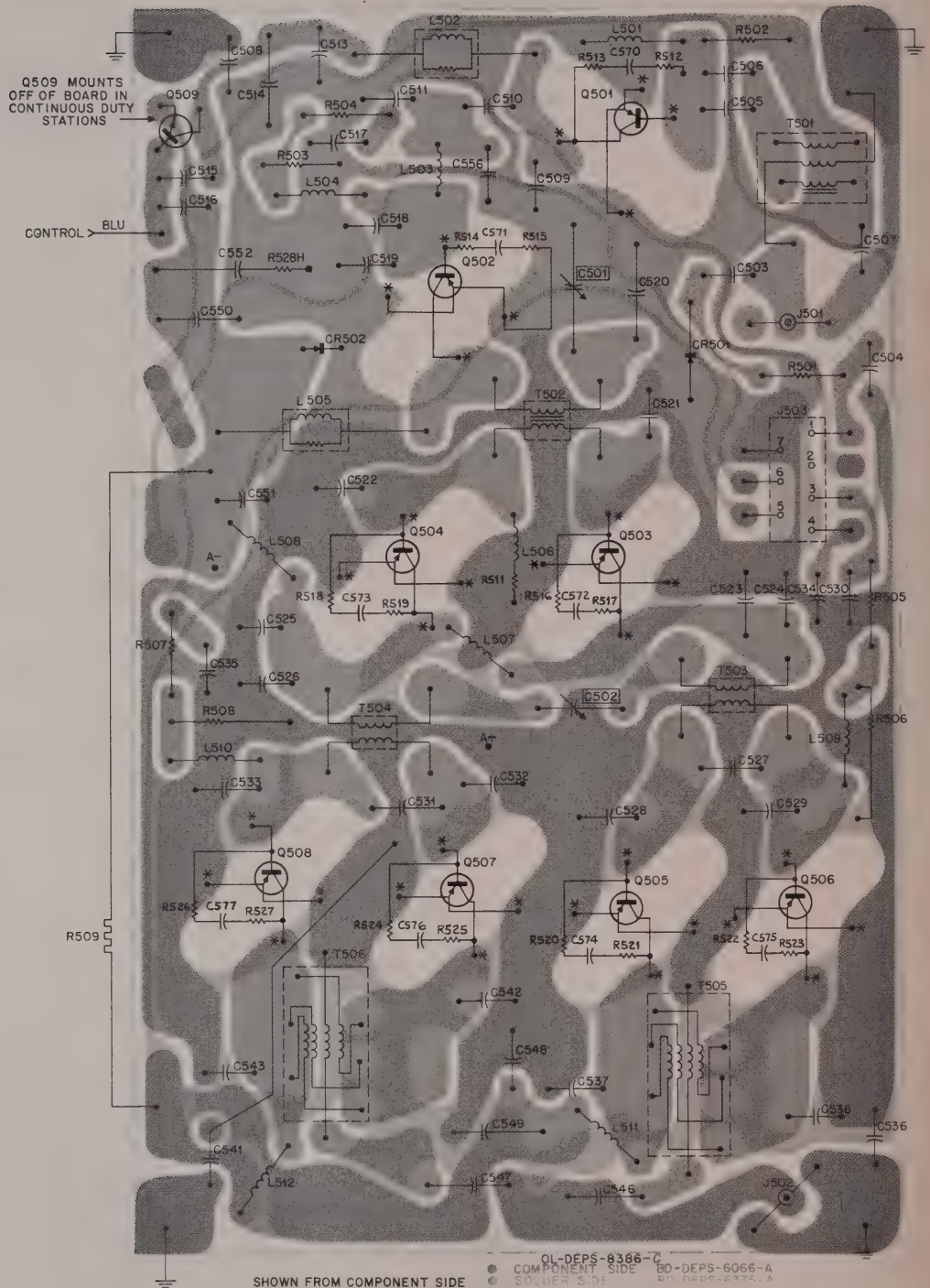
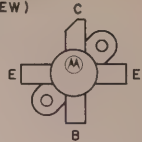
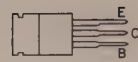
* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD

90/100/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-18126-A
6/20/80-PHI



PARTS LIST SHOWN ON
 BACK OF THIS DIAGRAM

90/100/110 W Power Amplifier
 Schematic Diagram
 Motorola No. PEPS-26753-O
 6/15/79-PHI

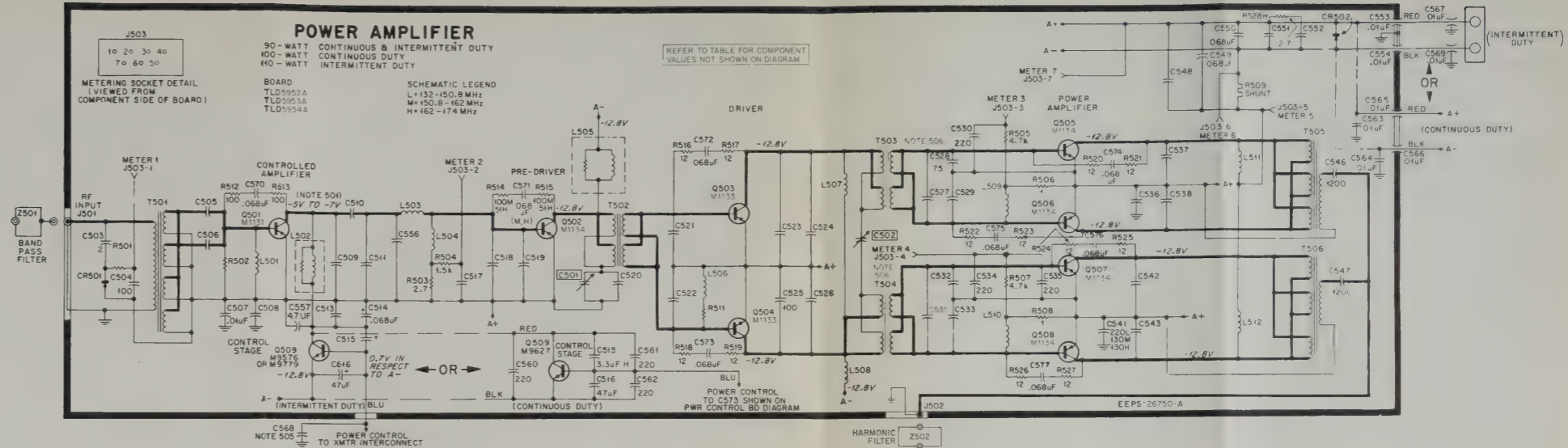


OL-DEPS-8386-7
BD-DEPS-6066-A
● COMPONENT SIDE
● SOLDER SIDE

* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD

90/100/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-18126-A
6/20/80-PHI

PA COMPONENT VALUES			
REF	136-150.8 MHz	150.8-162 MHz	162-174 MHz
C501	4-40	1.5-18	1.5-18
C502	2.4-27	2-19.3	2-19.3
C505	62	49	62
C506	62	51	34
C508	160	130	130
C509	15	15	10
C510	175	51	39
C511	62	51	39
C513	160	130	130
C515	-	3.3 uF	3.3 uF
C518	49	60	49
C519	49	60	43
C520	30	25	20
C521	62	43	43
C522	50	39	51
C523	80	100	120
C524	-	.01 uF	.05 uF
C526	-	.01 uF	.05 uF
C527	43	30	24
C528	75	75	80
C529	60	51	51
C531	43	30	24
C532	75	75	80
C533	62	60	68
C536	220	390	-
C537	130	150	100
C538	130	150	120
C541	220	130	130
C542	130	150	100
C543	120	130	100
C546	1200	1200	1200
C547	1200	1200	1200
C548	160	130	130
C551	160	130	130
C552	15 uF	100 uF	100 uF
C556	30	10	6
C557	-	-	4.7 uF
C571	-	.068 uF	.068 uF
L503	7-84400B03	1-1/2 turns	1-1/2 turns
L504	1 turn	1 turn	85
L506	.039 uH	.039 uH	290 nH
L507	2-1/2 turns	4-1/2 turns	4-1/2 turns
L508	2-1/2 turns	4-1/2 turns	4-1/2 turns
L509	0.29 uH	.039 uH	290 nH
L510	0.29 uH	.039 uH	290 nH
L511	4-1/2 turns	4-1/2 turns	0.29 uH
L512	4-1/2 turns	4-1/2 turns	0.29 uH
R501	100k	150k	150k
R502	10	10	49
R511	2.7	2.7	-
R514	-	100	51
R515	-	100	51
R528	-	-	2.7
T503	25-84859L01	25-84854L02	24-82060L01
T504	25-84859L02	25-84854L02	24-82060L01
T505	25-84860L01	25-84861L01	25-84861L01
T506	25-84860L01	25-84860L01	25-84861L01



POWER AMPLIFIERS

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED: CAPACITOR VALUES ARE IN PICOFARADS.
504. THE CONTROL STAGE TRANSISTOR IS BOARD-MOUNTED FOR INTERMITTENT DUTY OPERATION AND CHASSIS-MOUNTED FOR CONTINUOUS DUTY OPERATION.
505. C568 IS PART OF TRANSMITTER CHASSIS & HARDWARE KIT.
506. FOR FREQUENCY RANGE 162-174 MHz AIR-CORE TRANSFORMERS.

EPS-8362-A

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

90/100/110 W Power Amplifier
Schematic Diagram
Motorola No. PEPS-26753-O
6/15/79-PHI

A D.	DESCRIPTION
---------	-------------

	RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
	100k
	150k
	10 ±5%
	47
	2.7 ±5%
	1.5k
	4.7k
	1; 1/2 W (meter shunt)
	2.7 ±5%
	2.7 ±5%
	TRANSFORMER, RF:
1	pri: 5 turns
	sec: 4 windings, 1 turn each
1	pri: 2 windings, 1-3/4 turns each
	sec: 2 windings, 1-3/4 turns each
1	pri: 2 windings, 2-3/4 turns each
	sec: 2 windings, 2-3/4 turns each
1	NOTE: ("Left hand" windings)
	pri: 3-3/4 turns
	sec: 3-3/4 turns
1	pri: 2 windings, 2 turns each
	sec: 2 windings, 2 turns each
2	pri: 2 windings, 2-3/4 turns each
	sec: 2 windings, 2-3/4 turns each
2	NOTE: ("Right hand" windings)
	pri: 3-3/4 turns
	sec: 3-3/4 turns
1	pri: 2 windings, 2 turns each
	sec: 2 windings, 2 turns each
1	pri: 3 windings, 1-1/2 turns each
	sec: 6 turns
1	pri: 3 windings, 1-1/2 turns each
	sec: 5 turns
1	pri: 3 windings, 1-1/2 turns each
	sec: 6 turns
1	pri: 3 windings, 1-1/2 turns each
	sec: 5 turns

PL-1722-O

FILTER, RF: low pass; 132-150.8 MHz 150.8-174 MHz

et Kit

PL-1856-O

CAPACITOR, fixed: .01 uF +100-0%; 250 V
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74A is listed in the Transmitter
on.

TRN8069A Resistor-Capacitor Network Kit (132-150.8 MHz)
TRN6445A Resistor-Capacitor Network Kit (150.8-162 MHz)
TLD5502A Resistor-Capacitor Network Kit
(162-174 MHz)

PL-5396-A

C570, 572 thru 577	8-83813H05	CAPACITOR, fixed: .068 uF ±10%; 100 V
C571L		Not Used
C571M, 571H	8-83813H05.	.068 uF ±10%; 100 V
R512, 513	6-125C25	RESISTOR, fixed: 100 ±10%; 1/2 W
R514L, 515L		Not Used
R514M, 515M	6-125C25	100 ±10%; 1/2 W
R514H, 515H	6-125A18	51 ±5%; 1/2 W
R516 thru 527	6-125C03	12 ±10%; 1/2 W

90/100/110 W POWER AMPLIFIER

MODEL CHART

TLD1682A	132-150.8 MHz	INTERMITTENT DUTY
TLD1683B	150.8-162 MHz	
TLD1684B	162-174 MHz	
TLD1692C	132-150.8 MHz	CONTINUOUS DUTY
TLD1693D	150.8-162 MHz	
TLD1694D	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifiers provide the following features:

- A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.
- All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.
- Power transistors mounted directly to (but electrically isolated from) the heat sink.
- RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

90/100/110 W POWER AMPLIFIER



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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN5605A Xmtr. Chassis & Heat Sink
(Intermittent Duty) (part of TLD1680 Series) PL-6097-O

C553, 554 C555 C567 C568 C569	21-84211B01 23-83210A08 21-84211B01 21-82880E19 21-84211B01	CAPACITOR, fixed: .01 uF +100-0%; 250 V 100 uF +150-10%; 25 V .01 uF +100-0%; 250 V 500 pF ±10%; 500 V .01 uF +100-0%; 250 V
Q501 Q502 Q503, 504 Q505 thru 508 Q509	48-84411L31 48-84411L32 48-84411L33 48-84411L34 48-869576 or 48-869779	TRANSISTOR; (SEE NOTE) PNP; type M1131 PNP; type M1132 PNP; type M1133 PNP; type M1134 NPN; type M9576 NPN; type M9779

NOTE: Additional electrical components for TLN5605A are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

TLN5604A PA Hardware Kit
(Continuous Duty) (part of TLD1690 Series) PL-6098-O

Q501 Q502 Q503, 504 Q505 thru 508	48-84411L31 48-84411L32 48-84411L33 48-84411L34	TRANSISTOR; PNP; (SEE NOTE) type M1131 type M1132 type M1133 type M1134
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NOTE: Additional electrical components for TLN5604A are listed in the Power Control section; hardware is listed in the Transmitter Hardware Kits section.

TLN4780A PA Casting & Hardware Kit
(Continuous Duty) (part of TLD1690 Series) PL-1719-B

C563, 564	21-84211B02	CAPACITOR, fixed: .01 uF +100-0%; 250 V
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NOTE: Hardware for TLN4780A is listed in the Transmitter Hardware Kits section.

Exciter Output Filter PL-1721-O

Z501L Z501M, 501H	TFD6111A TFD6112A	FILTER, RF; bandpass; 132-150.8 MHz 150.8-174 MHz
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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TRN8012A Cable & Bracket Kit
(Continuous Duty) (part of TLD1690 Series) PL-6099-O

C560, 561, 562 C565, 566	21-410115 21-84463D01	CAPACITOR, fixed: 220 pF ±20%; .001 uF ±20%; 500 V
Q509	48-869627	TRANSISTOR; (SEE NOTE) NPN; type M9627

NOTE: Cable assemblies for TRN8012A are listed in the RF Cables section; additional electrical components are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

POWER AMPLIFIER (INTERMITTENT DUTY)

TLD1682B (132-150.8 MHz)
TLD1683C (150.8-162 MHz)
TLD1684C (162-174 MHz)

POWER AMPLIFIER (CONTINUOUS DUTY)

TLD1692D (132-150.8 MHz)
TLD1693E (150.8-162 MHz)
TLD1694E (162-174 MHz)

LEGEND:

L = 132-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD5952A PA Board (132-150.8 MHz)
TLD5953A PA Board (150.8-162 MHz)
TLD5954A PA Board (162-174 MHz) PL-6100-O

C501L C501M, 501H C502L	20-83201B09 20-83201B07 19-83491E08	CAPACITOR, fixed; pF; ±5%; 500 V; unless otherwise stated variable: 4-40 variable: 1.5-18 variable: 2.4-27 (voltage not stated)
C502M, 502H	19-83491E07	variable: 2-19.3 (voltage not stated)
C503 C504 C505L C505M C505H C506L C506M C506H C507 C508L C508M, 508H C509L C509M C509H C510L C510M C510H C511L C511M C511H C513L C513M, 513H C514, 549, 550 C515L C515M, 515H C516 C517 C518L C518M C518H C519L C519M C519H C520L C520M C520H C521L C521M, 521H C522L C522M C522H C523L C523M C523H C524L, 526L C524M, 526M C524H, 526H C525 C527L C527M C527H C528L, 528M C528H C529L C529M, 529H C530 C531L C531M C531H C532L, 532M C532H C533L	21-83406D52 21-84494B04 21-84494B02 21-84494B25 21-84494B02 21-84494B02 21-84494B01 21-84494B30 21-82428B59 21-84494B51 21-84494B26 21-84494B38 21-84494B38 21-84494B29 21-84494B09 21-84494B01 21-84494B24 21-84494B02 21-83366K20 21-84494B24 21-84494B51 21-84494B26 8-83813H05 23-83214C17 23-83214C10 21-83596E10 21-84494B25 21-84494B35 21-84494B25 21-84494B25 21-84494B35 21-84494B28 21-84936A06 21-84936A04 21-84936A03 21-84494B02 21-84494B28 21-84494B45 21-84494B24 21-84494B01 21-83366K12 21-83366K13 21-83366K14 21-82428B59 21-82372C04 21-83366K13 21-83366K19 21-83366K18 21-83366K17 21-83366K24 21-83366K25 21-83366K21 21-83366K20 21-83596E10 21-83366K19 21-83366K18 21-83366K17 21-83366K24 21-83366K25 21-83366K22	2 100 62 49 62 62 51 34 .01 uF +80-20%; 200 V 160 130 15 15 10 175 51 39 62 51 39 160 130 .068 uF ±10%; 100 V NOT USED 3.3 uF ±20%; 15 V 47 uF ±20%; 6 V 220 49 60 49 49 60 43 30 ±1.5 pF; 2000 V 25; 2000 V 20; 2000 V 62 43 56 39 51 80; 250 V 100; 250 V 120; 250 V NOT USED .01 uF +80-20%; 200 V .05 uF +80-20%; 25 V 100; 250 V 43 30 24 75 80 60 51 220 43 30 24 75 80 60 62

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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C533M C533H C534, 535 C536L C536M C536H C537L C537M C537H C538L C538M C538H C541L C541M, 541H C542L C542M C542H C543L C543M C543H C546, 547 C548L C548M, 548H C551L C551M, 551H C552L C552M C552H C556L C556M C556H C557H	21-83366K21 21-83366K23 21-83596E10 21-84494B12 21-84494B18 21-83366K15 21-83366K16 21-83366K13 21-83366K15 21-83366K16 21-83366K14 21-84494B12 21-84494B26 21-83366K15 21-83366K16 21-83366K13 21-83366K14 21-83366K15 21-83366K13 21-84426B36 21-84494B51 21-84494B26 21-84494B51 21-84494B26 23-83214C02 23-84669A19 23-82783B04 21-84494B33 21-84494B29 21-84494B74 23-82783B25	60 68 220 220 390 NOT USED 130; 250 V 150; 250 V 100; 250 V 130; 250 V 150; 250 V 120; 250 V 220 130 130; 250 V 150; 250 V 100; 250 V 120; 250 V 130; 250 V 100; 250 V 1200 160 130 160 130 15 uF ±20%; 25 V 100 uF +150-10%; 20 V 100 uF ±20%; 25 V 30 10 6 4.7 uF ±10%; 25 V
CR501 CR502	48-82139G01 48-82525G01	SEMICONDUCTOR DEVICE, diode; (SEE NOTE) germanium silicon
P501, 502 J503	28-84227B01 9-84207B01	CONNECTOR, receptacle; female: coaxial; miniature type 7-contact
L501 L502 L503L L503M, 503H L504L, 504M L504H L505 L506L, 506M L506H L507L, 508L L507M, 507H L508M, 508H L509L, 510L L509M L510M L509H, 510H L511L, 511M L511H L512L, 512M L512H	24-83961B01 24-84392B03 7-84400B03 24-83884G03 24-83961B03 24-82723H18 24-84392B02 24-82723H02 24-82723H20 24-83547G10 24-84393B02 24-84393B02 24-82723H04 24-82723H02 24-82723H02 24-82723H02 24-82723H20 24-84393B02 24-82723H04 24-84393B02 24-82723H04 24-84393B02 4-1/2 turns Choke; 0.29 uH 4-1/2 turns Choke; 0.29 uH	choke; 3 turns; coded BRN choke; 6 turns inductor "bracket" 1-1/2 turns choke; 1 turn; coded WHT choke; 85 nH choke; 4 turns choke; 39 nH choke; 290 nH choke; 2-1/2 turns choke; 4-1/2 turns choke; 4-1/2 turns choke; 0.29 uH choke; 39 nH choke; 39 nH choke; 290 nH 4-1/2 turns Choke; 0.29 uH 4-1/2 turns Choke; 0.29 uH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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R501L R501M, 501H R502L, 502M R502H R503 R504 R505, 507 R506, 508 R509 R511L, 511M R528H	6-124C97 6-124D02 6-124A01 6-124C17 6-124B55 6-124C53 6-124C65 6-125D70 6-84232B01 6-124D55 6-124D55	100k 150k 10 ±5% 47 2.7 ±5% 1.5k 4.7k 1; 1/2 W (meter shunt) 2.7 ±5% 2.7 ±5%
T501	25-84396B01	TRANSFORMER, RF; pri: 5 turns sec: 4 windings, 1 turn each
T502	25-84397B01	pri: 2 windings, 1-3/4 turns each sec: 2 windings, 1-3/4 turns each
T503L	25-84859L01	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each
T503M	25-84854L01	NOTE: ("Left hand" windings) pri: 3-3/4 turns sec: 3-3/4 turns
T503H	24-82060L01	pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each
T504L	25-84859L02	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each
T504M	25-84854L02	NOTE: ("Right hand" windings) pri: 3-3/4 turns sec: 3-3/4 turns
T504H	24-82060L01	pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each
T505L, 505M	25-84860L01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T505H	25-84861L01	pri: 3 windings, 1-1/2 turns each sec: 5 turns
T506L, 506M	25-84860L01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T506H	25-84861L01	pri: 3 windings, 1-1/2 turns each sec: 5 turns

PA Output (Harmonic) Filter PL-1722-O

Z502L Z502M, 502H	TFD6101A TFD6102A	FILTER, RF; low pass; 132-150.8 MHz 150.8-174 MHz
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TLN5074A Terminal Bracket Kit
(Intermittent Duty) PL-1856-O

C567, 569	21-84211B01	CAPACITOR, fixed: .01 uF +100-0%; 250 V
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NOTE: Hardware for TLN5074A is listed in the Transmitter Hardware Kits section.

TRN8069A Resistor-Capacitor Network Kit (132-150.8 MHz)
TRN6445A Resistor-Capacitor Network Kit (150.8-162 MHz)
TLD5502A Resistor-Capacitor Network Kit (162-174 MHz) PL-5396-A

C570, 572 thru 577 C571L C571M, 571H	8-83813H05 8-83813H05	CAPACITOR, fixed: .068 uF ±10%; 100 V Not Used .068 uF ±10%; 100 V
R512, 513 R514L, 515L R514M, 515M R514H, 515H R516 thru 527	6-125C25 6-125C25 6-125A18 6-125C03	RESISTOR, fixed: 100 ±10%; 1/2 W Not Used 100 ±10%; 1/2 W 51 ±5%; 1/2 W 12 ±10%; 1/2 W

90/100/110 W POWER AMPLIFIER

MODEL CHART

TLD1682A	132-150.8 MHz	INTERMITTENT DUTY
TLD1683B	150.8-162 MHz	
TLD1684B	162-174 MHz	
TLD1692C	132-150.8 MHz	CONTINUOUS DUTY
TLD1693D	150.8-162 MHz	
TLD1694D	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	90 W Continuous & Intermittent
	100 W Continuous
	110 W Intermittent
Output Impedance	50 ohms
Power Requirements	12.8 volts @20.5 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifiers provide the following features:

-A minimum of 110 W (intermittent duty) or 100 W (continuous duty) rf output.

-All circuitry except power transistors (and control stage transistor in continuous duty stations) contained on one double-sided circuit board.

-Power transistors mounted directly to (but electrically isolated from) the heat sink.

-RF connections made through two coaxial connections which plug directly into the input and output filter assemblies located below the heat sink shelf.

-DC power supplied via two feed-through capacitors that also provide filtering.

-Input, output and most other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the pre-driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only two tuning adjustments are required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

90/100/110 W POWER AMPLIFIER

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-Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

-Diode protection against reverse polarity voltage (board mounted diode).

-Output protection provided by a control stage transistor driven by power control circuit. (Controls gain of the first stage). In intermittent duty stations, a single-wire connection provides interconnection between power control and PA circuitry. In continuous duty stations three wire connections provide the interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband matching network and applied to the pre-driver stage. A second ferrite transformer is utilized to match the single-ended output of the pre-driver stage to the input of the push-pull driver stage. The output of the driver stage is split by a pair of transformers to drive each of the push-pull final power amplifier stages. The output from each final stage is stepped up in impedance by ferrite transformers and paralleled to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pins 3 and 4 reflect the output drive signal and operation of the two push-pull power amplifier stages. Reference position A on a Motorola Portable Test

Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board. It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in metering or a Motorola portable test set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA. All such equipment is battery operated which permits testing to be performed in the field where no commercial power is available for bench type test equipment. Option built-in station metering when incorporated takes the place of the portable test set.

(1) Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however a low impedance multimeter is acceptable for dc voltage measurements only.

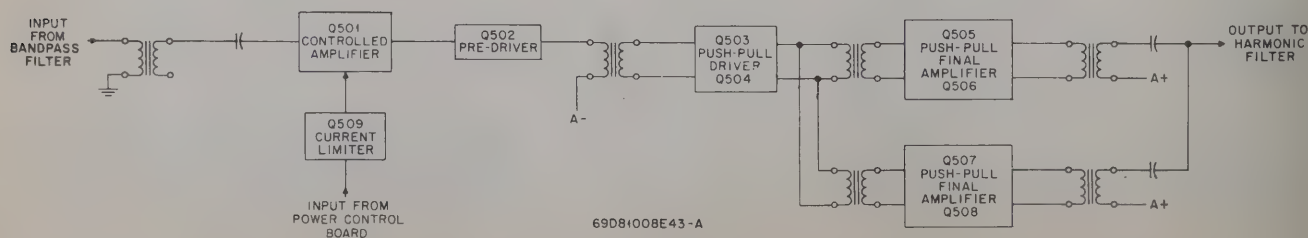


Figure 1. Block Diagram

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Test Set Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station meter kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

This procedure is valid only with intermittent duty station. Continuous duty stations with built-in station metering measure only exciter output (PA input), PA current, and PA voltage.

a. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

b. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

c. Turn the station ON.

d. With the meter selector switch set to position 1, key the transmitter and observe the meter. Unkey the transmitter.

Set the selector switch to position 2, 3, and 4 keying the transmitter and observing the meter reading for each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows the "Using the Portable Test Set" paragraphs.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows.

a. Set the function selector switch of the portable test set to the XMTR position.

b. Set the meter reversing switch of the test set to the METER REV position, the selector switch to position 1, and REF switch to position A.

c. Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

d. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

e. The entire transmitter is necessary for testing PA boards including the power control board for proper control.

f. The output of the station must be terminated in one of three types of loads:

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

g. Turn the station ON.

h. Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

i. Set the selector switch to positions 2, 3, & 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for

each. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be operating normally.

(b) The power control board should be known to be functioning normally.

(2) Key the transmitter and observe power out, which should be 90, 100, or 110 watts, depending upon licensing.

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION PORTABLE TEST SET ONLY	MINIMUM METER READINGS	CIRCUIT METERED	IF LOW, DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	15 uA	Exciter Output (input to Controlled Amplifier Q501)	Exciter output, input circuitry of controlled amplifier stage Q501
2	A	5 uA	Input of Pre-driver Stage (Q502)	Output of controlled amplifier stage input circuitry of predriver stage
3	A	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q505, Q506	Input of Q505, Q506 stages, output of driver stage (Q502, Q503), output of predriver stage Q502
4	A	12 uA (100 W / 110 W) 10 uA (90 W)	Input of Final Amplifier Stage Q507, Q508	Input of Q507, Q508 stage output of driver stage Q502, Q503. Output of predriver stage Q502
5 (or 2 SEE NOTE)	B	21 uA min. } 90 W 27 uA max. } 23 uA min. } 100 W 37 uA max. } 110 W	Total Current in Final Amplifier Stages Q505, Q506, Q507, Q508	Output of final amplifier stages Q505-Q508, power control board antenna switch, antenna.
6 (or 3 SEE NOTE)	B	12 V (0-30 V scale)	Final Amplifier Stage	Final amplifier stage A+ or A-input

NOTE

When optional built-in station metering is used in continuous duty stations, only exciter output (PA input), final PA current, and final PA voltage may be checked. Selector switch position functions change to:

SELECTOR SWITCH POSITION	FUNCTION METERED
1	PA input
2	PA current
3	PA voltage
4	Forward power monitor
5	Reflected power monitor
6	Control voltage

(3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the radio set and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA decks, several checks can be made prior to extensive troubleshooting.

a. Visual

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for proper voltages at the collectors of each transistor. Certain defects such as broken plating, broken leads etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarize these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of P-N-P transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection of "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

The schematic diagram of the PA board contains the voltage readings required for troubleshooting. The readings are typical for normal operating conditions at rated power output for the radio. Refer to the troubleshooting chart, and the schematic when a defect is suspected in the PA board.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at both base and emitter,

POTH devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type de-soldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

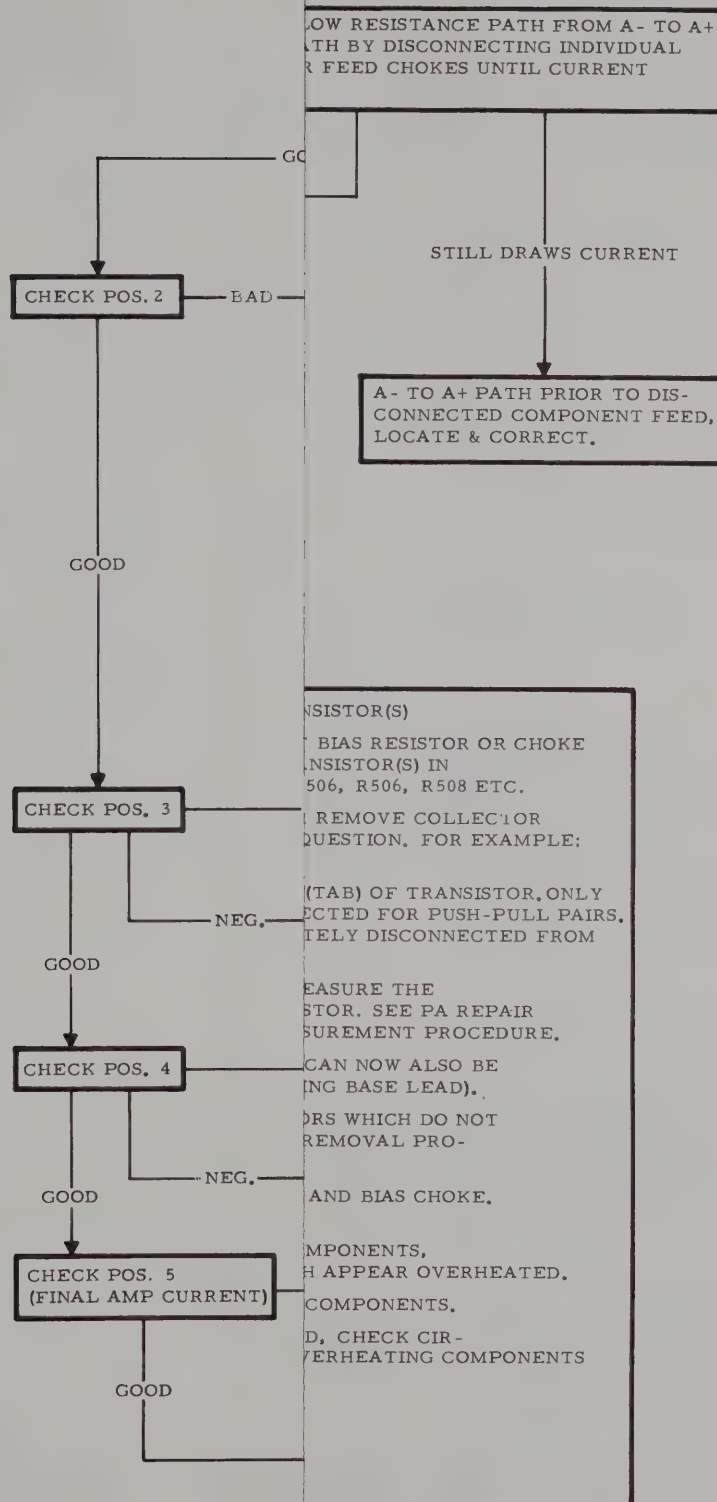
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



POTI devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type de-soldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board carefully lift out the transistor.

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(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10 or RX100 scale (preferably RX10 if available).

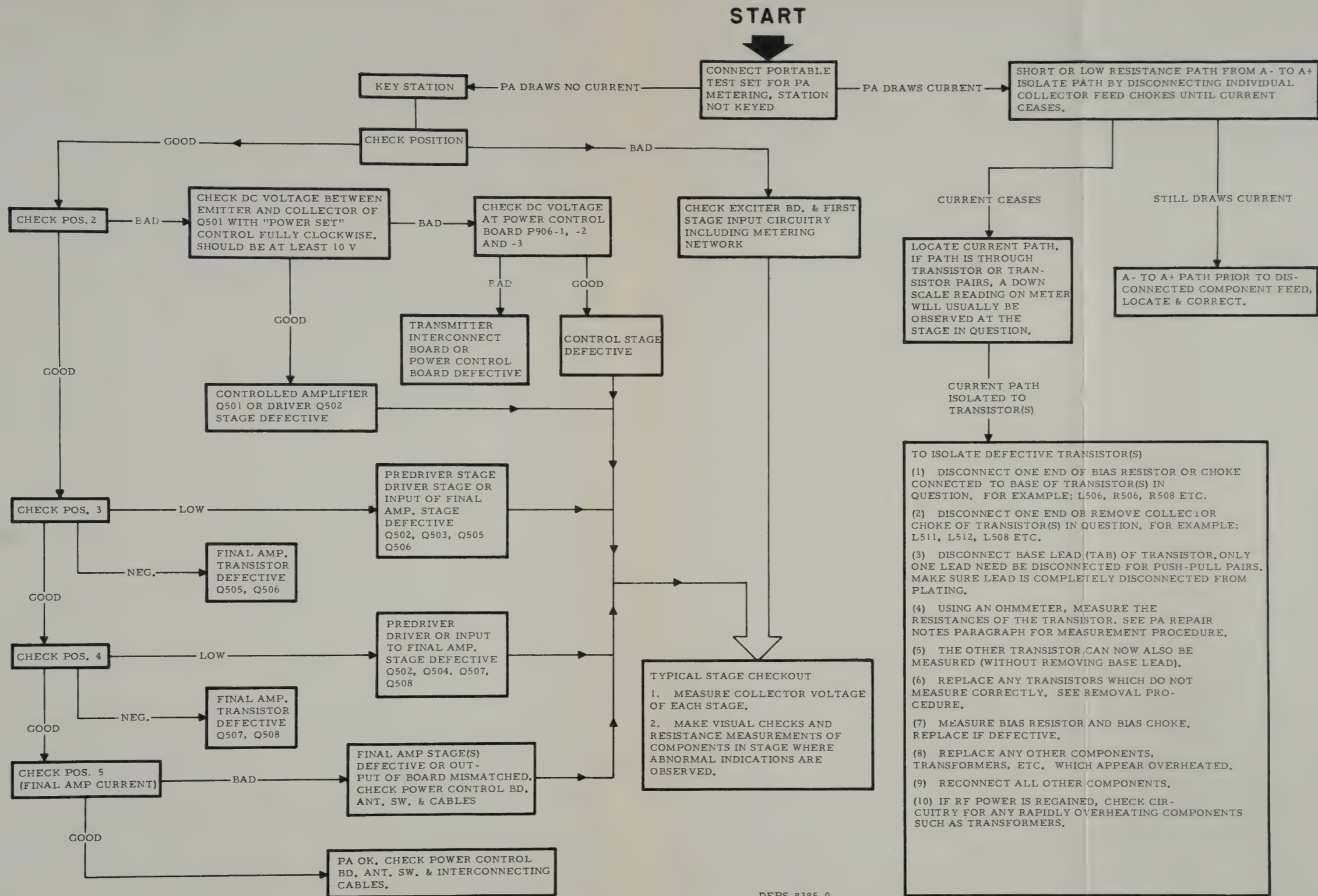
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement).

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



POWER AMPLIFIER ALIGNMENT PROCEDURE (CONT'D)

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
5	C501, C502	POWER CONTROL BOARD	5	METER REV. REF B	PA DRIVER OUTPUT - Tune C501, then C502 for a minimum meter 5 reading.
6	POWER SET	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A	OUTPUT - Adjust the POWER SET control for rated power output and perform step 5. (If rated power cannot be attained, repeat steps 4 and 5.)
			5	METER REV. REF B	Check meter 5 reading, it must not exceed 50 uA.
7		PA	5	METER REV. REF B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (I_c). I_c in amperes is the meter 5 reading (0-50) x 1/2.
8		PA	6	METER REV. REF B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_c). V_c is the meter 6 reading (0-30 volt scale).
9					Determine final input power (P_{in}). P_{in} equals $V_c \times I_c$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

NOTE
Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage - - polarity is automatically reversed as required when built-in station metering is used.

EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

1. Radio transmitters shall be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
2. The rf power output of a transmitter shall be no more than required for satisfactory technical operation considering area covered and local conditions. This power should be measured and the results recorded for future reference:
 - a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter which may increase the power input.
 - c. At intervals of one year (to determine system performance).
3. Frequency and deviation of a transmitter should be checked:
 - a. When it is initially installed.
 - b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - c. At intervals of one year (adjust if necessary).

POWER AMPLIFIER ALIGNMENT PROCEDURE

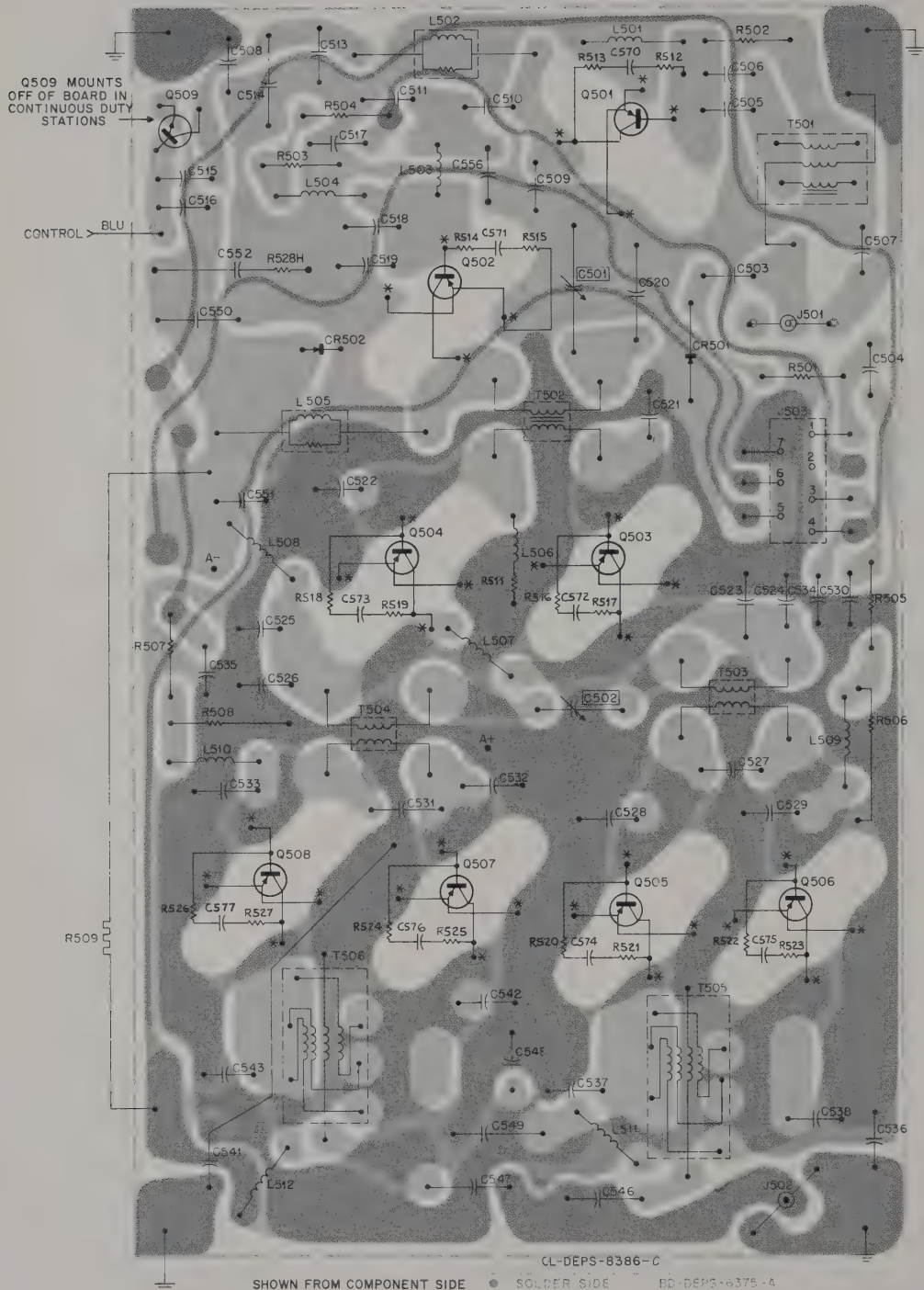
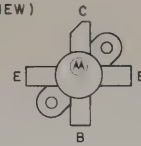
STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
1					Align the exciter.
2					For complete power amplifier tune-up, proceed with step 3. To check alignment move metering plug to power control board and go to step 6.
3	C501, C502				PA PRE-ALIGNMENT - Set C501 fully clockwise and C502 to maximum capacity (plate fully meshed).
4	POWER SET	POWER CONTROL BOARD	Wattmeter or 1 AND METER REV. REF B	METER REV. REF A	OUTPUT-Move the metering plug to the power control board. Without exceeding rated power output of 90, 100, or 110 watts on the watt-meter or calibration label value on meter 1, adjust the POWERSET control for rated power or until no further increase in power output is observed. If meter 5 reads 15-25 uA, go to step 5. If meter 5 reads above 25 uA, then adjust the POWER SET control counterclockwise until meter 5 is between 15-25 uA.

90/100/110 W Power Amplifier
Alignment Procedure
Motorola No. PEPS-8588-D
6/15/79-PHI

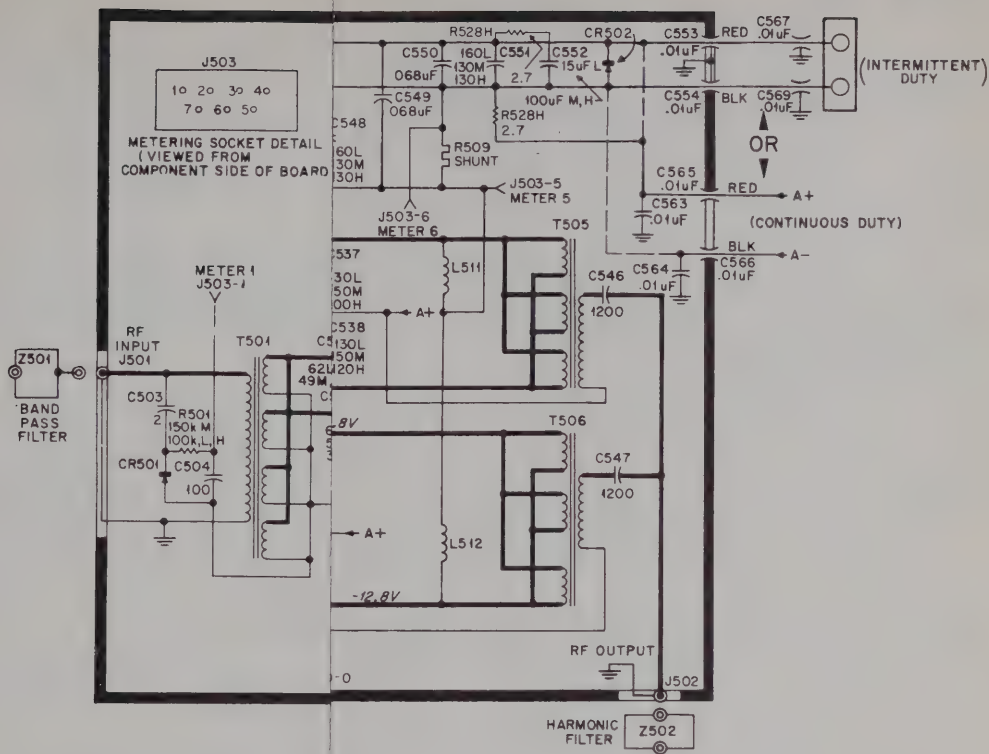
POWER AMPLIFIER ALIGNMENT PROCEDURE (CONT'D)

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. & ADAPTER CABLE REF. SWITCHES (SEE NOTE)	STAGE AND PROCEDURE
5	C501, C502	POWER CONTROL BOARD	5	METER REV. REF B	PA DRIVER OUTPUT - Tune C501, then C502 for a minimum meter 5 reading.
6	POWER SET	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF A	OUTPUT - Adjust the POWER SET control for rated power output and perform step 5. (If rated power cannot be attained, repeat steps 4 and 5.)
			5	METER REV. REF B	Check meter 5 reading, it must not exceed 50 uA.
7		PA	5	METER REV. REF B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (I_c). I_c in amperes is the meter 5 reading $(0-50) \times 1/2$.
8		PA	6	METER REV. REF B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_c). V_c is the meter 6 reading $(0-30 \text{ volt scale})$.
9					Determine final input power (P_{in}). P_{in} equals $V_c \times I_c$. P_{in} should be less than: 180 watts for 90-watt models; 200 watts for 100-watt continuous duty models and 110-watt intermittent duty models.

TRANSISTOR DETAILS
(TOP VIEW)



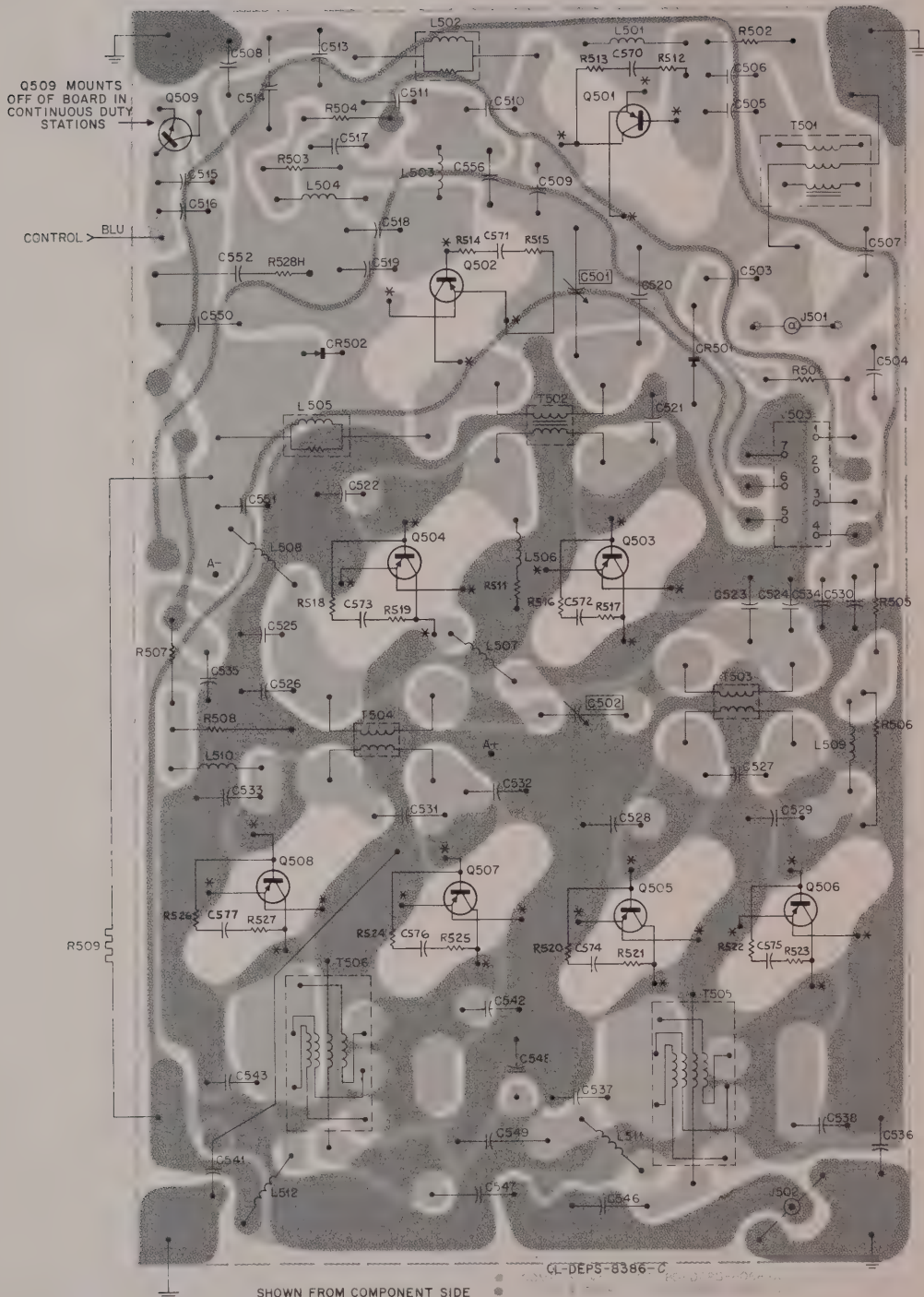
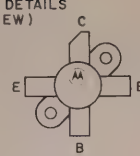
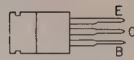
90/100/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-18126-A
6/15/79-PHI



PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
90/100/110 W Power Amplifier
Schematic Diagram
Motorola No. PEPS-23760-A
6/20/80-PHI

90/100/120 W POWER AMPLIFIER

TRANSISTOR DETAILS
(TOP VIEW)



* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD

90/100/110 W Power Amplifier
Circuit Board Detail
Motorola No. PEPS-18126-A
6/15/79-PHI

REFERENCE MBOL	MOTOROLA PART NO.	DESCRIPTION
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535	21-84494B35	60
	21-84494B34	68
	21-83596E10	220
	21-84494B12	220
	21-84494B18	390
541H		NOT USED
	21-84395B05	130
	21-84395B06	150
	21-84395B02	100
	21-84395B05	130
	21-84395B06	150
	21-84395B04	120
	21-84494B12	220
	21-84494B26	130
	21-84395B05	130
	21-84395B06	150
	21-84395B02	100
	21-84395B04	120
	21-84395B05	130
	21-84395B02	100
	21-84426B36	1200
	21-84494B51	160
	21-84494B26	130
	21-84494B51	160
	21-84494B26	130
547	23-83214C02	15 uF $\pm 20\%$; 25 V
	23-84669A19	100 uF $\pm 150-10\%$; 20 V
	23-82783B04	100 uF $\pm 20\%$; 25 V
	21-84494B33	30
	21-84494B29	10
	21-84494B74	6
	23-82783B25	4.7 uF $\pm 10\%$; 25 V
		<u>SEMICONDUCTOR DEVICE,</u>
	48-82139G01	diode: (SEE NOTE)
	48-82525G01	germanium silicon
502		<u>CONNECTOR, receptacle:</u>
	28-84227B01	female:
	9-84207B01	coaxial; miniature type 7-contact
503H 504M	24-83961B01	<u>COIL, RF:</u> choke; 3 turns; coded BRN
	24-84392B03	choke; 6 turns
	7-84400B03	inductor "bracket"
	24-83884G03	1-1/2 turns
	24-83961B03	choke; 1 turn; coded WHT
	24-82723H18	choke; 85 nH
	24-84392B02	choke; 4 turns
	24-82723H02	choke; 39 nH
	24-82723H20	choke; 290 nH
	24-83547G10	choke; 2-1/2 turns
	24-84393B02	choke; 4-1/2 turns
	24-84393B02	choke; 4-1/2 turns
	24-82723H04	choke; 0.29 uH
	24-82723H02	choke; 39 nH
	24-82723H02	choke; 39 nH
510H	24-82723H20	choke; 290 nH
		<u>RESISTOR, fixed: $\pm 10\%$; 1/4 W;</u>
		unless otherwise stated
	6-124D02	150k
	6-124C01	10
	6-124C17	47
	6-124B55	2.7 $\pm 5\%$
	6-124C53	1.5k
	6-124C65	4.7k
	6-125D70	1; 1/2 W
508	6-84232B01	(meter shunt)
	6-124D55	2.7 $\pm 5\%$
	6-124D55	2.7 $\pm 5\%$
		<u>TRANSFORMER, RF:</u>
	25-84396B01	pri: 5 turns
511M		sec: 4 windings, 1 turn each
	25-84397B01	pri: 2 windings, 1-3/4 turns each
		sec: 2 windings, 1-3/4 turns each
	24-84302C01	pri: 2 windings, 2-3/4 turns each
		sec: 2 windings, 2-3/4 turns each
		NOTE: ("Left hand" windings)
	24-84464D01	pri: 3-3/4 turns
		sec: 3-3/4 turns
	24-82060L01	pri: 2 windings, 2 turns each
		sec: 2 windings, 2 turns each

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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T504L	24-84302C02	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each NOTE: ("Right hand" windings)
T504M	24-84464D01	pri: 3-3/4 turns sec: 3-3/4 turns
T504H	24-82060L01	pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each
T505L, 505M	25-84812B01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T505H	25-84398B01	pri: 3 windings, 1-1/2 turns each sec: 5 turns
T506L, 506M	25-84812B01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T506H	25-84398B01	pri: 3 windings, 1-1/2 turns each sec: 5 turns

PA Output (Harmonic) Filter

PL-1722-O

Z502L	TFD6101A	<u>FILTER, RF: low pass;</u>
Z502M, 502H	TFD6102A	132-150.8 MHz 150.8-174 MHz

TLN5074A Terminal Bracket Kit (Intermittent Duty)

PL-1856-O

C567, 569	21-84211B01	<u>CAPACITOR, fixed:</u> .01 uF $\pm 100-0\%$; 250 V
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NOTE: Hardware for TLN5074A is listed in the Transmitter
Hardware Kits section.

TRN8069A Resistor-Capacitor Network Kit (132-150.8 MHz)
TRN6445A Resistor-Capacitor Network Kit (150.8-162 MHz)
TLD5502A Resistor-Capacitor Network Kit
(162-174 MHz)

PL-5396-A

C570, 572 thru 577	8-83813H05	<u>CAPACITOR, fixed:</u> .068 uF $\pm 10\%$; 100 V
C571L		Not Used
C571M, 571H	8-83813H05	.068 uF $\pm 10\%$; 100 V
R512, 513	6-125C25	<u>RESISTOR, fixed:</u> 100 $\pm 10\%$; 1/2 W
R514L, 515L		Not Used
R514M, 515M	6-125C25	100 $\pm 10\%$; 1/2 W
R514H, 515H	6-125A18	51 $\pm 5\%$; 1/2 W
R516 thru 527	6-125C03	12 $\pm 10\%$; 1/2 W

60 W POWER AMPLIFIER

MODEL TABLE

MODEL	FREQUENCY RANGE	APPLICATION
TLD1673A	150.8-162 MHz	Intermittent Duty
TLD1674A	162-174 MHz	
TLD1703B/C	150.8-162 MHz	Continuous Duty
TLD1704B/C	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	60 watts (50 watts optional)
Output Impedance	50 ohms
Power Requirements	13.0 volts @11 amps

*All values are typical

1. DESCRIPTION

Motorola's TLD1670A and TLD1700B/C Series Power Amplifiers provide the following features:

- A minimum of 60 W rf output (50 W optional).
- All circuitry contained on one double-sided circuit board.
- Power transistors (and control stage transistor in continuous duty stations) mounted directly to (but electrically isolated from) the heat sink.

- RF connections made through two coaxial connections which plug directly into the input and output.

- DC power supplied via two feedthrough capacitors that also provide filtering.

- Input, output, and most other critical interstage matching is accomplished by the use of rf transformers wound around ferrite cores. Only one tuning adjustment is required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

60 W POWER AMPLIFIER

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN4728A Xmtr. Chassis & Heat Sink
(Intermittent Duty) (part of TLD1680 Series) PL-1717-D

C553, 554	21-84211B01	<u>CAPACITOR, fixed:</u> .01 uF +100-0%; 250 V
C555	23-83210A08	100 uF +150-10%; 25 V
C567	21-84211B01	.01 uF +100-0%; 250 V
C568	21-82880E19	500 pF ±10%; 500 V
C569	21-84211B01	.01 uF +100-0%; 250 V
Q501	48-869622	<u>TRANSISTOR:</u> (SEE NOTE) P-N-P; type M9622
Q502	48-869623	P-N-P; type M9623
Q503, 504	48-869624	P-N-P; type M9624
Q505 thru 508	48-869625	P-N-P; type M9625
Q509	48-869576 or 48-869779	N-P-N; type M9576 N-P-N; type M9779

NOTE: Additional electrical components for TLN4728A are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

TLN4741A PA Hardware Kit
(Continuous Duty) (part of TLD1690 Series) PL-1718-C

Q501	48-869622	<u>TRANSISTOR: P-N-P;</u> (SEE NOTE) type M9622
Q502	48-869623	type M9623
Q503, 504	48-869624	type M9624
Q505 thru 508	48-869625	type M9625

NOTE: Additional electrical components for TLN4741A are listed in the Power Control section; hardware is listed in the Transmitter Hardware Kits section.

TLN4780A PA Casting & Hardware Kit
(Gontinuous Duty) (part of TLD1690 Series) PL-1719-B

C563, 564	21-84211B02	<u>CAPACITOR, fixed:</u> .01 uF +100-0%; 250 V
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NOTE: Hardware for TLN4780A is listed in the Transmitter Hardware Kits section.

Exciter Output Filter PL-1721-O

Z501L	TFD6111A	<u>FILTER, RF: bandpass;</u> 132-150.8 MHz
Z501M, 501H	TFD6112A	150.8-174 MHz

TLN4822A Cable & Bracket Kit
(Continuous Duty) (part of TLD1690 Series) PL-1720-B

C560, 561, 562	21-410115	<u>CAPACITOR, fixed:</u> 220 pF ±20%;
C565, 566	21-84463D01	.001 uF ±20%; 500 V
Q509	48-869627	<u>TRANSISTOR:</u> (SEE NOTE) N-P-N; type M9627

NOTE: Cable assemblies for TLN4822A are listed in the RF Cables section; additional electrical components are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

POWER AMPLIFIER (INTERMITTENT DUTY)
TLD1682A (132-150.8 MHz)
TLD1683B (150.8-162 MHz)
TLD1684B (162-174 MHz)

POWER AMPLIFIER (CONTINUOUS DUTY)

TLD1692C (132-150.8 MHz)
TLD1693C (150.8-162 MHz)
TLD1694C (162-174 MHz)

LEGEND:
L = 132-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD5482A PA Board (132-150.8 MHz)
TLD5483A PA Board (150.8-162 MHz)
TLD5484A PA Board (162-174 MHz) PL-5395-O

C501L	20-83201B09	<u>CAPACITOR, fixed: pF; ±5%;</u> 500 V; unless otherwise stated
C502M, 502H	20-83201B07	variable: 4-40
C502L	19-83491E08	variable: 1.5-18
C502M, 502H	19-83491E07	variable: 2.4-27 (voltage not stated)
C503	21-83406D52	variable: 2-19.3 (voltage not stated)
C504	21-84494B04	2
C505L	21-84494B02	100
C505M	21-84494B25	62
C505H	21-84494B02	49
C506L	21-84494B02	62
C506M	21-84494B01	62
C506H	21-84494B30	51
C507	21-82428B59	34
C508L	21-84494B51	.01 uF +80-20%; 200 V
C508M, 508H	21-84494B26	160
C509L	21-84494B38	130
C509M	21-84494B38	15
C509H	21-84494B29	15
C510L	21-84494B09	10
C510M	21-84494B01	175
C510H	21-84494B24	51
C511L	21-84494B02	39
C513L	21-84494B51	62
C513M, 513H	21-84494B26	160
C514, 549, 550	8-83813H05	130
C515L, 515M		.068 uF ±10%; 100 V
C515H	23-83214C17	NOT USED
C516	23-83214C10	3.3 uF ±20%; 15 V
C517	21-83596E10	47 uF ±20%; 6 V
C518L	21-84494B25	220
C518M	21-84494B35	49
C518H	21-84494B25	60
C519L	21-84494B25	49
C519M	21-84494B35	49
C519H	21-84494B28	60
C520L	21-84936A06	43
C520M	21-84936A04	30 ±1.5 pF; 2000 V
C520H	21-84936A03	25; 2000 V
C521L	21-84494B02	20; 2000 V
C521M, 521H	21-84494B28	62
C522L	21-84494B45	43
C522M	21-84494B24	56
C522H	21-84494B01	39
C523L	21-84395B03	51
C523M	21-84395B02	80
C523H	21-84395B04	100
C524L, 526L		120
C524M, 526M	21-82428B59	NOT USED
C524H, 526H	21-82372C04	.01 uF +80-20%; 200 V
C525	21-84395B02	.05 uF +80-20%; 25 V
C527L	21-84494B28	100
C527M	21-84494B43	43
C527H	21-84494B41	36
C528L	21-84494B31	24
C528M	21-84494B31	75
C528H	21-84494B03	75
C529L	21-84494B35	80
C529M, 529H	21-84494B01	60
C530	21-83596E10	51
C531L	21-84494B28	220
C531M	21-84494B43	43
C531H	21-84494B41	36
C532L	21-84494B31	24
C532M	21-84494B31	75
C532H	21-84494B03	75
C533L	21-84494B02	80
		62

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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C533M	21-84494B35	60
C533H	21-84494B34	68
C534, 535	21-83596E10	220
C536L	21-84494B12	220
C536M	21-84494B18	390
C536H		NOT USED
C537L	21-84395B05	130
C537M	21-84395B06	150
C537H	21-84395B02	100
C538L	21-84395B05	130
C538M	21-84395B06	150
C538H	21-84395B04	120
C541L	21-84494B12	220
C541M, 541H	21-84494B26	130
C542L	21-84395B05	130
C542M	21-84395B06	150
C542H	21-84395B02	100
C543L	21-84395B04	120
C543M	21-84395B05	130
C543H	21-84395B02	100
C546, 547	21-84426B36	1200
C548L	21-84494B51	160
C548M, 548H	21-84494B26	130
C551L	21-84494B51	160
C551M, 551H	21-84494B26	130
C552L	23-83214C02	15 uF ±20%; 25 V
C552M	23-84669A19	100 uF +150-10%; 20 V
C552H	23-82783B04	100 uF ±20%; 25 V
C556L	21-84494B33	30
C556M	21-84494B29	10
C556H	21-84494B74	6
C557	23-82783B25	4.7 uF ±10%; 25 V
CR501	48-82139G01	<u>SEMICONDUCTOR DEVICE,</u> diode: (SEE NOTE) germanium
CR502	48-82525G01	silicon
T501, 502	28-84227B01	<u>CONNECTOR, receptacle:</u> female:
J503	9-84207B01	coaxial; miniature type 7-contact
L501	24-83961B01	<u>COIL, RF:</u> choke; 3 turns; coded BRN
L502	24-84392B03	choke; 6 turns
L503L	7-84400B03	inductor "bracket"
L503M, 503H	24-83884G03	1-1/2 turns
L504L, 504M	24-83961B03	choke; 1 turn; coded WHT
L504H	24-82723H18	choke; 85 nH
L505	24-84392B02	choke; 4 turns
L506L, 506M	24-82723H02	choke; 39 nH
L506H	24-82723H20	choke; 290 nH
L507L, 508L	24-83547G10	choke; 2-1/2 turns
L507M, 507H	24-84393B02	choke; 4-1/2 turns
L508M, 508H	24-84393B02	choke; 4-1/2 turns
L509L, 510L	24-82723H04	choke; 0.29 uH
L509M	24-82723H02	choke; 39 nH
L510M	24-82723H02	choke; 39 nH
L509H, 510H	24-82723H20	choke; 290 nH
R501	6-124D02	<u>RESISTOR, fixed: ±10%; 1/4 W;</u> unless otherwise stated
R502L, 502M	6-124C01	150k
R502H	6-124C17	10
R503	6-124B55	47
R504	6-124C53	2.7 ±5%
R505, 507	6-124C65	1.5k
R506, 508	6-125D70	4.7k
R509	6-84232B01	1; 1/2 W
R511L, 511M	6-124D55	(meter shunt)
R528H	6-124D55	2.7 ±5%
T501	25-84396B01	2.7 ±5%
T502	25-84397B01	<u>TRANSFORMER, RF:</u> pri: 5 turns sec: 4 windings, 1 turn each
T503L	24-84302C01	pri: 2 windings, 1-3/4 turns each sec: 2 windings, 1-3/4 turns each
T503M	24-84464D01	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each
T503H	24-82060L01	NOTE: ("Left hand" windings) pri: 3-3/4 turns sec: 3-3/4 turns
		pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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T504L	24-84302C02	pri: 2 windings, 2-3/4 turns each sec: 2 windings, 2-3/4 turns each
T504M	24-84464D01	NOTE: ("Right hand" windings) pri: 3-3/4 turns sec: 3-3/4 turns
T504H	24-82060L01	pri: 2 windings, 2 turns each sec: 2 windings, 2 turns each
T505L, 505M	25-84812B01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T505H	25-84398B01	pri: 3 windings, 1-1/2 turns each sec: 5 turns
T506L, 506M	25-84812B01	pri: 3 windings, 1-1/2 turns each sec: 6 turns
T506H	25-84398B01	pri: 3 windings, 1-1/2 turns each sec: 5 turns

PA Output (Harmonic) Filter PL-1722-O

Z502L	TFD6101A	<u>FILTER, RF: low pass;</u> 132-150.8 MHz
Z502M, 502H	TFD6102A	150.8-174 MHz

TLN5074A Terminal Bracket Kit
(Intermittent Duty) PL-1856-O

C567, 569	21-84211B01	<u>CAPACITOR, fixed:</u> .01 uF +100-0%; 250 V
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NOTE: Hardware for TLN5074A is listed in the Transmitter Hardware Kits section.

TRN8069A Resistor-Capacitor Network Kit (132-150.8 MHz)
TRN6445A Resistor-Capacitor Network Kit (150.8-162 MHz)
TLD5502A Resistor-Capacitor Network Kit (162-174 MHz) PL-5396-A

C570, 572 thru 577	8-83813H05	<u>CAPACITOR, fixed:</u> .068 uF ±10%; 100 V
C571L		Not Used
C571M, 571H	8-83813H05	.068 uF ±10%; 100 V
R512, 513	6-125C25	<u>RESISTOR, fixed:</u> 100 ±10%; 1/2 W
R514L, 515L		Not Used
R514M, 515M	6-125C25	100 ±10%; 1/2 W
R514H, 515H	6-125A18	51 ±5%; 1/2 W
R516 thru 527	6-125C03	12 ±10%; 1/2 W

60 W POWER AMPLIFIER

MODEL TABLE

MODEL	FREQUENCY RANGE	APPLICATION
TLD1673A	150.8-162 MHz	Intermittent Duty
TLD1674A	162-174 MHz	
TLD1703B/C	150.8-162 MHz	Continuous Duty
TLD1704B/C	162-174 MHz	

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	60 watts (50 watts optional)
Output Impedance	50 ohms
Power Requirements	13.0 volts @11 amps

*All values are typical

1. DESCRIPTION

Motorola's TLD1670A and TLD1700B/C Series Power Amplifiers provide the following features:

- A minimum of 60 W rf output (50 W optional).
- All circuitry contained on one double-sided circuit board.
- Power transistors (and control stage transistor in continuous duty stations) mounted directly to (but electrically isolated from) the heat sink.

- RF connections made through two coaxial connections which plug directly into the input and output.

- DC power supplied via two feedthrough capacitors that also provide filtering.

- Input, output, and most other critical interstage matching is accomplished by the use of rf transformers wound around ferrite cores. Only one tuning adjustment is required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

60 W POWER AMPLIFIER

- One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

- Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

- Diode protection against reverse polarity voltage (board mounted diode).

- Output protection provided by a control stage transistor driven by the power control circuit (Controls gain of the first stage). In intermittent duty stations, a single-wire provides interconnection between power control and PA circuitry. In continuous duty stations, three wires provide this interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband, matching network and applied to the pre-driver stage. A parallel capacitor network couples the output of the pre-driver to the base of the driver stage. The output of the driver stage is split by

a transformer to drive the push-pull final power amplifier stage. The output from the final stage is stepped up in impedance by a ferrite transformer to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pin 3 permits observation of the drive output of the pre-driver stage and an indication of the operation of the driver stage. Pin 4 reflects the drive signal and operation of the two push-pull power amplifier stages. Pin 5 permits observation of the collector currents of the push-pull final amplifier stages. Reference position A on a Motorola Portable Test Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board.

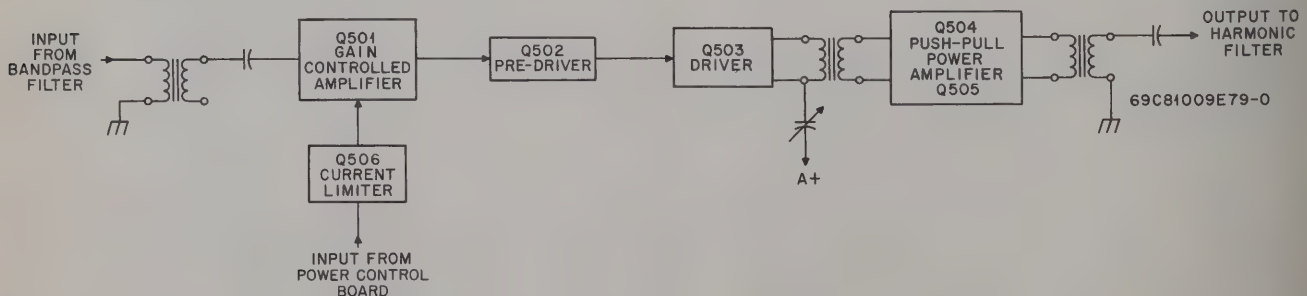


Figure 1. Block Diagram

It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in station metering or a Motorola Portable Test Set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA.

(1) Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation. Optional built-in station metering, when incorporated, takes the place of the portable test set.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however, a low impedance meter is acceptable for dc voltage measurements only.

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station metering kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

The optional built-in station metering is similar to the portable test set except PA voltage is measured with the two voltage probes. The built-in metering polarity switch is set to REV for PA metering and FWD for Power Control Board metering.

(a) The entire transmitter is necessary for testing PA boards including the power board for proper control.

(b) The output of the station must be terminated in one of three types of loads:

-- The antenna load.

-- A dummy load such as Motorola's T1013A RF Load Resistor.

-- An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

(c) Turn the station ON.

(d) With the meter selector switch set to PA position 1 and the meter plug connected to the power amplifier, key the transmitter and observe the meter. Unkey the transmitter. Set the selector switch to positions 2, 3, and 4, keying the transmitter and observing the meter reading for each position. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad is given in the MINIMUM PA METER READINGS table.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows:

(a) Set the function selector switch of the portable test set to the XMTR position.

(b) Set the meter reversing switch of the test set to the METER REV position.

(c) Set the selector switch of the test set to position 1 and reference position A.

(d) Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

(e) Connect the red "control" plug of the adapter cable to the control receptacle on the

local or remote control chassis circuit board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

(f) The entire transmitter is necessary for testing PA boards including the power control board for proper control.

(g) The output of the station must be terminated in one of three types of loads:

-- The antenna load.

-- A dummy load such as Motorola's T1013A RF Load Resistor.

-- An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

(h) Turn the station ON.

(i) Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

(j) Set the selector switch to positions 2, 3, and 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for each. On multi-frequency stations repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be functioning normally.

(b) The power control board should be known to be functioning normally.

(c) Antenna switch should be known to be operating normally (base stations only).

(2) Key the transmitter and observe power out, which should be 60 watts.

(3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the station and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor mounted on the inner wall) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA deck, several checks can be made prior to extensive troubleshooting.

a. Visually

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for the proper voltage at the collector of each transistor. Certain defects such as broken plating, broken leads, etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION (See Metering Note)	REFERENCE SWITCH POSITION (Portable Test Set Usage Only)	MINIMUM METER READING	CIRCUIT METERED	IF LOW, THE DEFECTIVE CIRCUIT IS
1	A	15 uA	RF output of exciter and collector voltage of controlled amplifier (PA input)	Exciter, controlled amplifier, or current limiter
2	A	5 uA	Controlled amplifier output	Controlled amplifier or pre-driver
3	A	10 uA	Pre-driver output	Pre-driver or driver
4	A	13 uA	Driver output and power amplifier input	Driver or power amplifier
5	B	25 uA min. 40 uA max.	Final amplifier output current	Final amplifier
6	B	12 V (0-30 V scale)	Final amplifier voltage	Final amplifier A+ or A- input

METERING NOTE

When optional built-in station metering is used in continuous duty stations, only exciter output (PA input), final PA current, and final PA voltage power amplifier functions may be checked. Selector switch position functions change to:

PA CHASSIS SELECTOR SWITCH POSITION	FUNCTION METERED	METER READING
1	PA input	15 uA min.
2	Final PA current	25 uA min, 40 uA max.
3	Final PA voltage	12 V normal
4	Forward power monitor	22-45 uA normal
5	Reflected power monitor	3-8 uA normal
6	Control voltage	3-35 uA normal

troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarizes these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of PNP transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection to "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac

CAUTION (CONT)

operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at the base, emitter and collector, BOTH devices should be measured individually when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type desoldering device.

(3) Gently lift each tab, one at a time while applying heat.

(4) When all four tabs are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10, or RX100 scale (preferably RX10 if available).

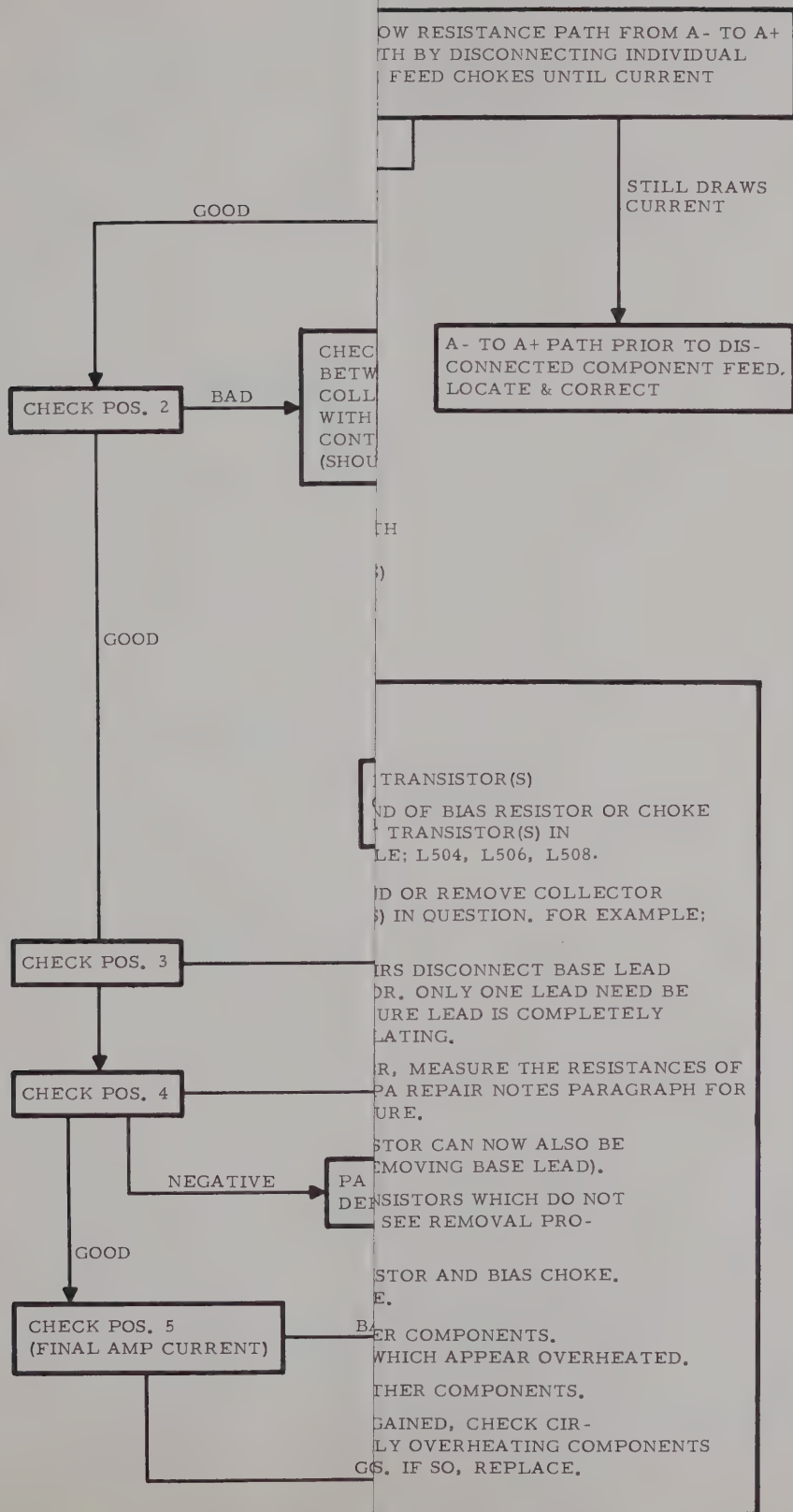
(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement.)

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



CAUTION (CONT)

operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at the base, emitter and collector, BOTH devices should be measured individually when a defect in the pair is suspected.

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(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type desoldering device.

(3) Gently lift each tab, one at a time while applying heat.

(4) When all four tabs are loose from the board carefully lift out the transistor.

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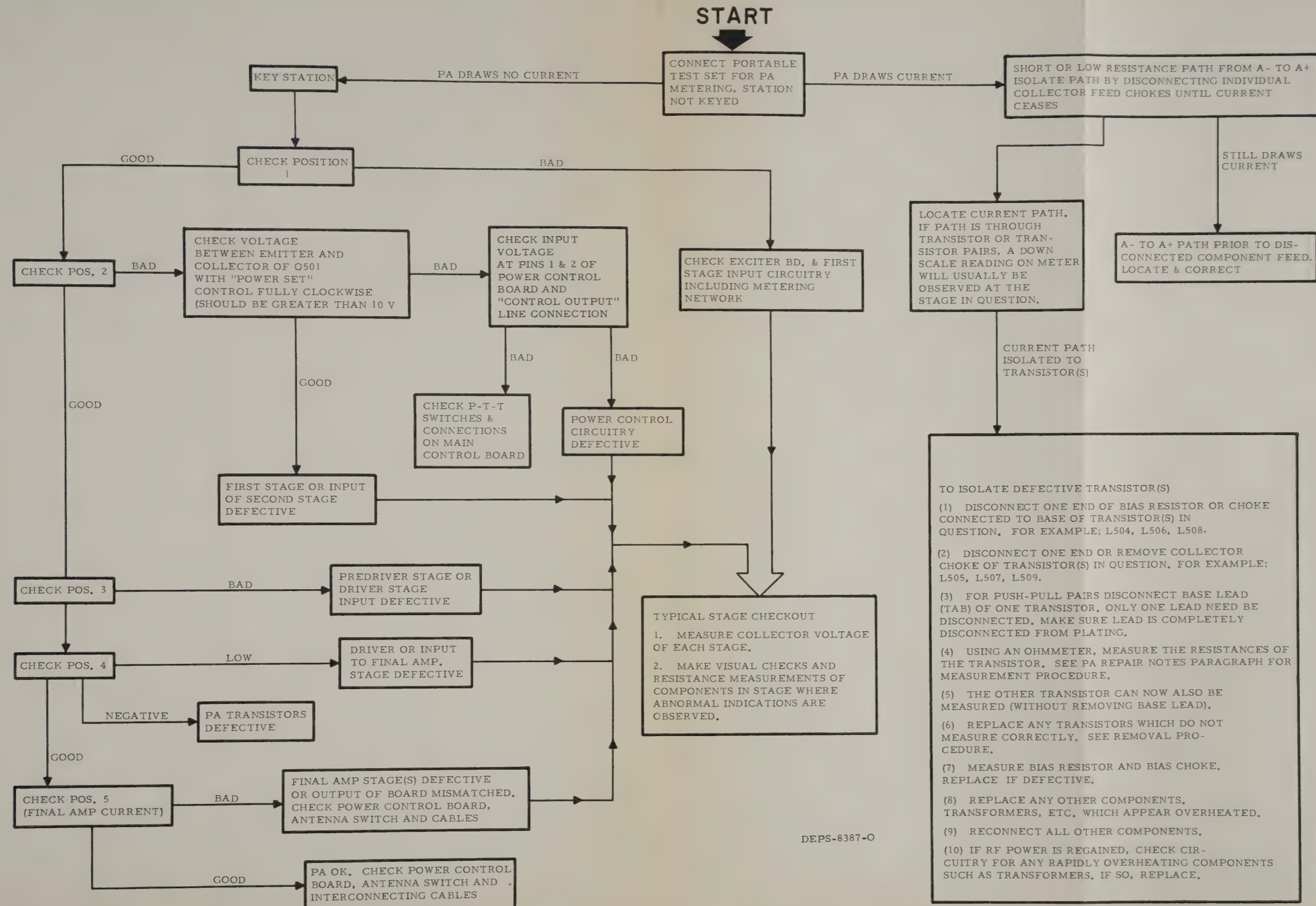
(a) With the positive probe on the base, no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement.)

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.

PA TROUBLESHOOTING CHART



PORTABLE TEST		
STEP	METERING PLUG LOCATION	TEST SW PC
1	--	
2	--	June-up, gment,
3	--	01 fully
4	POWER CONTROL BOARD	5 POWER SET reading is ob- R SET control. uA, pro- n 50 uA, ng.
5	POWER CONTROL BOARD	Wated power m or calibra- or just the POWER until no fur- s observed. 5 uA, adjust (if less than kwise) until d 25 uA.
6	POWER CONTROL BOARD	501 for
7	POWER CONTROL BOARD	WSET control m at step 6 ored, repeat not exceed 50 uA. 5
8	PA	5 - The rela- ding and the is 50 uA = he final col- take 1/5
9	PA	6 - The reading asured is asure the olts, read
10	--	- Pin = 0 watts.

Power Amplifier Alignment Procedure
Motorola No. EPS-8638-C
6/20/80-PHI

FCC Regulations state that:

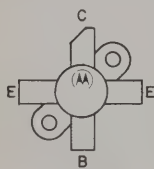
1. Radio transmitters may be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
2. The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization. This power input shall be measured and the results recorded:
 - a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter which may increase the power input.
 - c. At intervals not to exceed one year.
3. Frequency and deviation of a transmitter must be checked:
 - a. When it is initially installed.
 - b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - c. At intervals not to exceed one year.

ALIGNMENT PROCEDURE

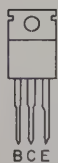
STEP	PORTABLE TEST SET			OPTIONAL BUILT-IN METER SWITCHES POSITION					ADJUST	STAGE AND PROCEDURE
	METERING PLUG LOCATION	TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER CHASSIS SELECTOR SWITCH INTERMITTENT DUTY MODELS	CONTINUOUS DUTY MODELS	TRANSMITTER SELECTOR SWITCH (INTERMITTENT DUTY ONLY)	EXCITER SELECTOR SWITCH (CONTINUOUS DUTY ONLY)	POWER AMPLIFIER SELECTOR SWITCH (CONTINUOUS DUTY ONLY)		
1	--	--	--	--	--	--	--	--	--	Align the exciter.
2	--	--	--	--	--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
3	--	--	--	--	--	--	--	--	C501	PA PRE-ALIGNMENT - Set C501 fully clockwise.
4	POWER CONTROL BOARD	5	METER REV. REF B	XMIT	PA	PWR CONT 5	5	4	POWER SET C501	OUTPUT - Gradually rotate the POWER SET control until an initial meter 5 reading is observed. Do not readjust POWER SET control. If this indication is less than 50 uA, proceed with step 5. If greater than 50 uA, tune C501 for an on-scale reading.
5	POWER CONTROL BOARD	Watt-meter or 1&5	METER REV. REFA	XMIT	PA	PWR CONT 1	5	2	POWER SET	OUTPUT - Without exceeding rated power output of 60 watts on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA Meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
6	POWER CONTROL BOARD	5	METER REV. REF B	XMIT	PA	PWR CONT 5	5	4	C501	PA DRIVER OUTPUT - Tune C501 for minimum meter 5 reading.
7	POWER CONTROL BOARD	Watt-meter or 1	METER REV. REF A	XMIT	PA	PWR CONT 1	5	2	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 5 and 6).
		5	METER REV. REF B	XMIT	PA	PWR CONT 5	5	4		Check meter reading, it must not exceed 50 uA.
8	PA	5	METER REV. REF B	XMIT	PA	PA5	5	5	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 10A. Therefore, to measure the final collector current (I_c) in amperes, take 1/5 the meter reading.
9	PA	6	METER REV. REF B	XMIT	PA	PA6	5	6	--	FINAL COLLECTOR VOLTAGE - The relationship between the meter reading and the actual voltage being measured is 50 uA = 50 V. Therefore, to measure the final collector voltage (V_c) in volts, read the meter directly.
10	--	--	--	--	--	--	--	--	--	FINAL INPUT POWER - (P_{in}) - $P_{in} = V_c I_c$ and should be less than 120 watts.



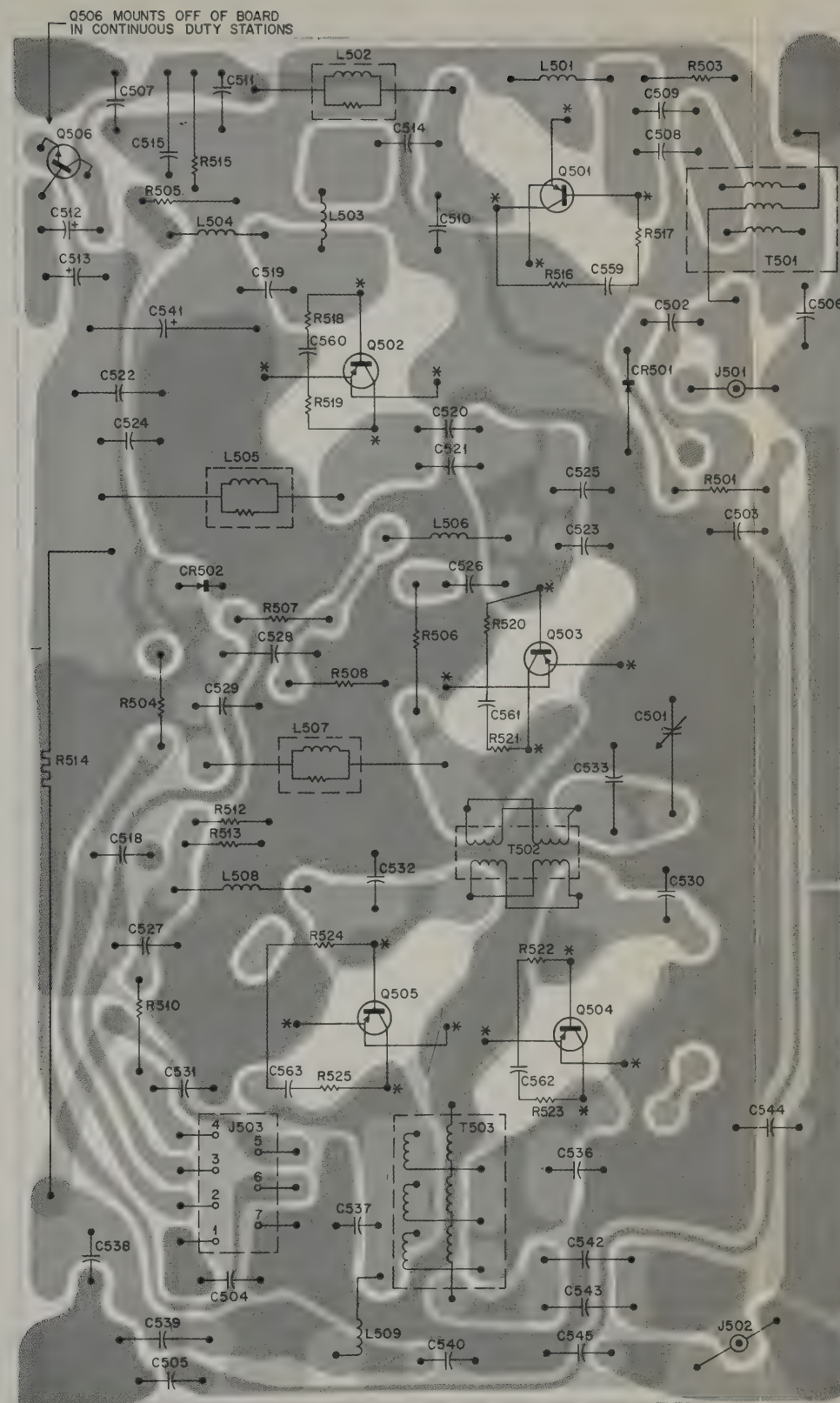
TRANSISTOR DETAILS



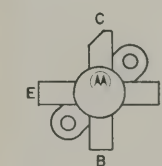
TOP VIEW



FRONT VIEW



TRANSISTOR DETAILS



TOP VIEW

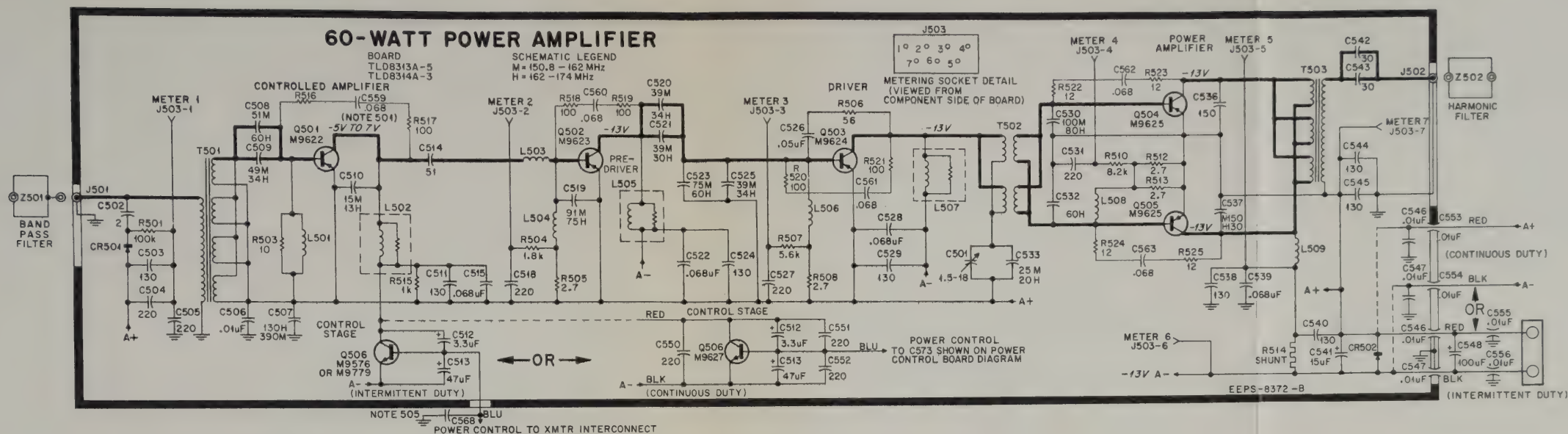


FRONT VIEW

60-Watt Power Amplifier
Circuit Board Detail
Motorola No. PEPS-8639-A
6/20/80-PHI

* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD.

● COMPONENT SIDE BD-DEPS-6435-B
OL-DEPS-8388-A



POWER AMPLIFIERS

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED: CAPACITOR VALUES ARE IN PICOFARADS.
504. THE CONTROL STAGE TRANSISTOR IS BOARD-MOUNTED FOR INTERMITTENT DUTY OPERATION AND CHASSIS-MOUNTED FOR CONTINUOUS DUTY OPERATION.
505. C568 IS PART OF TRANSMITTER CHASSIS & HARDWARE KIT.
506. FOR FREQUENCY RANGE 162-174 MHz AIR-CORE TRANSFORMERS.

EPS-8362-A

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM
60-Watt Power Amplifier
Schematic Diagram
Motorola No. 63P81015E13-C
6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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501	28C84227B01	CONNECTOR, receptacle; male; coaxial; miniature type
502	28C84227B01	
503	9C84207B01	
501	24C83961B01	COIL, RF: choke; consists of a ferrite core with a 3-turn winding
502H	24C84392B03	
502HH	24C84392B01	
503	24C83884G03	choke; consists of a resistor (120 Ohms $\pm 10\%$; 1 Watt) covered with a 6-turn winding choke; 1-1/2 turns, molded
504	24C83961B01	choke; consists of a ferrite core with a 3-turn winding
505	24C84392B02	
506H	24D82723H04	
506HH	24B83977B01	choke; 0.29 uH choke; 1-1/2 turns on ferrite body
507	24C84392B04	choke; consists of a resistor (100 Ohms $\pm 10\%$; 2 Watt) covered with a 4-turn winding
508	24B83977B01	choke; 1-1/2 turns on ferrite body
509	24B84393B02	choke; 5-1/2 turns
501	6S124C97	RESISTOR, fixed: $\pm 10\%$; 1/4 W; unless otherwise stated 100k
503	6S124A01	
504	6S124C55	
505	6S124B55	1.8k
506	6S125C19	2.7 $\pm 5\%$
507	6S124C67	56; 1/2 W
508	6S124B55	5.6k
510	6S124C71	2.7 $\pm 5\%$
512	6S124B55	8.2k
513	6S124B55	2.7 $\pm 5\%$
514	6C84232B02	(meter shunt)
515	6S124C49	1k
501	25C84396B01	TRANSFORMER, RF: pri: 5 turns sec: 4 windings, 1 turn each
502	25C84818B01	
503	25B84012C01	

TLN4742A PA Hardware Kit (continuous duty)
(p/o TLD1703A & TLD1704A) PL-1737-A

501	48R869622	TRANSISTOR; (SEE NOTE) P-N-P; type M9622
502	48R869623	
503	48R869624	
504, 505	48R869625	

NOTE:
Additional electrical components for TLN4742A are listed in the Power Control and Transmitter Interconnect sections; hardware is listed in the Transmitter Hardware Kits section.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN4780A PA Heat Sink Kit (continuous duty)
(p/o TLD1703A & TLD1704A) PL-1738-O

C546, 547	21C84211B02	CAPACITOR, fixed; .01 uF +100-0%; 250 V
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NOTE:

Hardware for TLN4780A is listed in the Transmitter Hardware Kits section.

TLN5922A Input Bracket and Cable PL-5090-O

C560, 561, 562	21-410115	CAPACITOR, fixed; 220 pF $\pm 20\%$; 500 V .001 uF; 250 V
C565, 566	21-84211B01	
Q509	48-869627	TRANSISTOR; (SEE NOTE) NPN; type M9627

NOTE: Cable assemblies are listed in the RF Cables section; additional electrical components are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

TLN4781A Xmtr. Chassis & Heat Sink (intermittent duty)
(p/o TLD1673A & TLD1674A) PL-1740-B

C548	23D83210A08	CAPACITOR, fixed; 100 uF +150-10%; 25 V
C555 thru 558	21C84211B01	
C568	21-82880E19	.01 uF +100-0%; 250 V 500 pF $\pm 10\%$; 1000 V
Q501	48R869622	TRANSISTOR; (SEE NOTE) P-N-P; type M9622 P-N-P; type M9623 P-N-P; type M9624 P-N-P; type M9625 N-P-N; type M9576 N-P-N; type M9779
Q502	48R869623	
Q503	48R869624	
Q504, 505	48R869625	
Q506	48R869576	
	or 48R869779	

NOTE:

Additional electrical components for TLN4781A are listed in the Transmitter Interconnect section; hardware is listed in the Transmitter Hardware Kits section.

TLN5074A Terminal Bracket Kit PL-1831-O

C555, 556	21-84211B01	CAPACITOR, fixed; .01 uF +100-0%; 250 V
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NOTE:

Hardware for TLN5074A is listed in the Transmitter Hardware Kits section.

Exciter Output Filter PL-1741-O

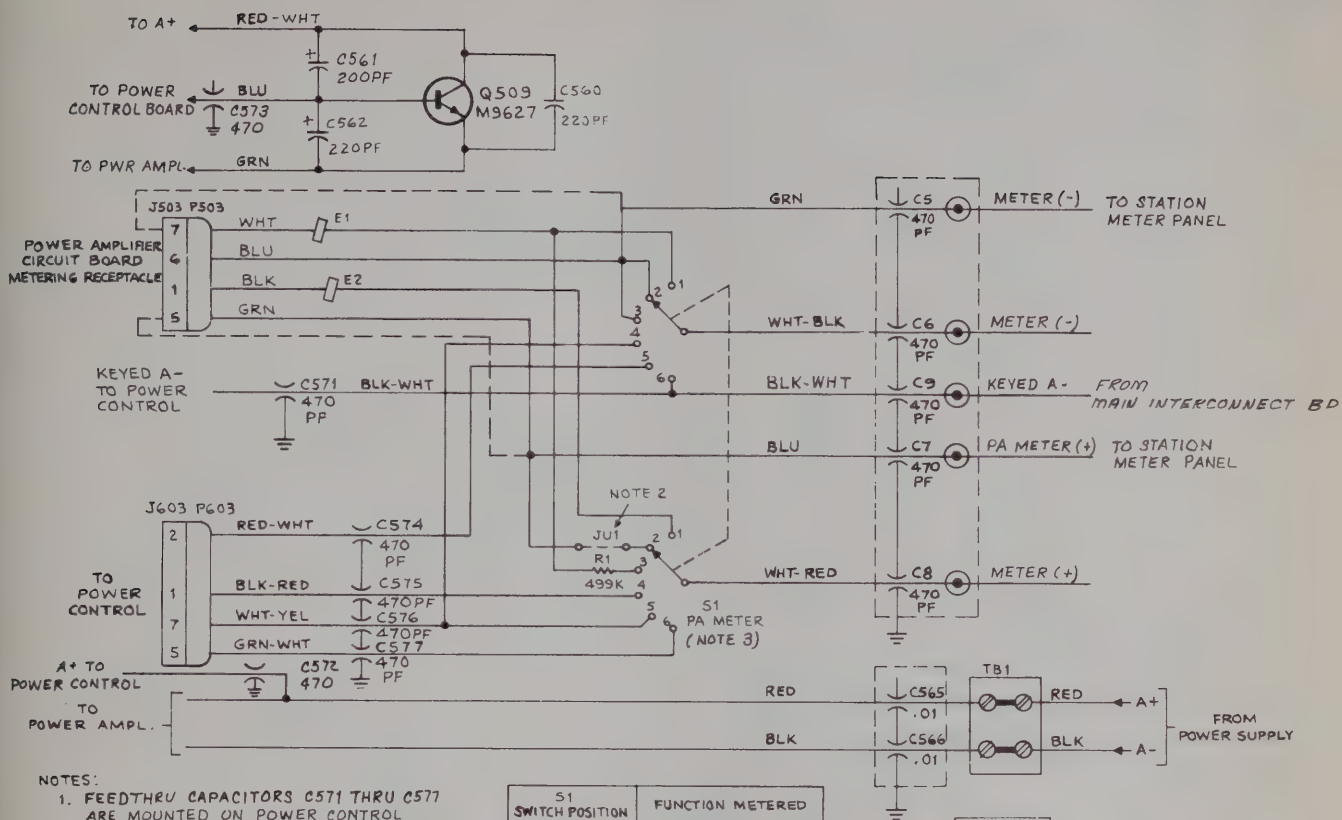
Z501	TFD6112A	FILTER, RF: bandpass; 150.8-174 MHz
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PA Output (Harmonic) Filter PL-1742-O

Z502	TFD6102A	FILTER, RF: low-pass 150.8-174 MHz
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NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



NOTES:

1. FEEDTHRU CAPACITORS C571 THRU C577 ARE MOUNTED ON POWER CONTROL BOARD MOUNTING BRACKET, ALL OTHER COMPONENTS ARE MOUNTED ON PA INPUT BRACKET
2. JU1 IS REMOVED WHEN A SECOND METER IS USED TO MEASURE PA CURRENT.
3. PA METER SWITCH S1 AND ASSOCIATED COMPONENTS (P503, P603, E1, E2, AND R1) ARE PART OF THE V VERSION/ AMPLIFIER MODELS AND ARE SHOWN HERE FOR REFERENCE ONLY TO PROVIDE INTERCONNECTION DATA. CONNECTIONS SHOWN IN DASHED LINES ARE USED ON UNIFIED CHASSIS MODELS.

S1 SWITCH POSITION	FUNCTION METERED
1	PA INPUT
2	FINAL PA CURRENT
3	FINAL PA VOLTAGE
4	FORWARD POWER
5	REFLECTED POWER
6	CONTROL VOLTAGE

P503 DETAIL
(SHOWN FROM PIN SIDE)

CEPS-22932-A

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
TLN5922A Input Bracket and
Cable Assembly
Schematic Diagram
Motorola No. 63P81033E29-A
6/20/80-PHI

REVISIONS				
PEPS-8640-A				
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TLN4781A	Q506	ADDED ALTERNATE TRANSISTOR 48R869779, TYPE M9779	PARTS LIST	NOT AFFECTED

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TRN6444A R-C Regen Suppressor Kit
 (P/O TLD1670 Series & TLD1700 Series)

PL-3530-O

C559-563	8D83813H05	CAPACITOR .068 uF ±10%; 100 V
R516-519 R520, 521 R522-525	6S125C25 6S125C11 6S125C03	RESISTOR; fixed: ±10%; 1/2 W 100 27 12

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

IMPORTANT
USE ONLY THE FOLLOWING MOTOROLA
PART NUMBERS WHEN ORDERING
REPLACEMENT PARTS

LEGEND:
 H = (150.8-162 MHz)
 HH = (162-174 MHz)

TLD8313A PA Board (150.8-162 MHz)
 TLD8314A PA Board (162-174 MHz)

PL-1736-A

C501 C502 C503 C504 C505 C506 C507HH C507H C508H C508HH C509H C509HH C510H C510HH C511H C511HH C512 C513 C514 C515	20C83201B07 21D83406D52 21D84494B26 21D83596E10 21D83596E10 21D82428B59 21D84494B26 21D84494B18 21D84494B01 21D84494B35 21D84494B25 21D84494B30 21D84494B38 21D84494B36 21D84494B26 NOT USED 23D83214C17 23D83214C10 21D84494B01 8D83813H05	CAPACITOR, fixed; pF; ±5% 500 V; unless otherwise stated variable: 1.5-18; 100 V 2 ±0.25 pF; NP0 130 220 ±20% 220 ±20% .01 uF +80-20%; 200 V 130 pF 390 pF 51 60 49 34 15 13 130 NOT USED 3.3 uF ±20%; 25 V 47 uF ±20%; 25 V 51 pF .068 uF ±10%; 100 V
C518 C519H C519HH C520H C520HH C521H C521HH C522 C523H C523HH C524 C525H C525HH C526 C527 C528 C529 C530	21D83596E10 21D84494B52 21D84494B31 21D84494B24 21D84494B30 21D84494B24 21D84494B33 8D83813H05 21D84494B31 21D84494B35 21D84494B26 21D84494B24 21D84494B30 21C82372C04 21D83596E10 8D83813H05 21D84494B26 21D84395B03	220 ±20% 91 pF 75 39 34 39 30 .068 uF ±10%; 100 V 75 60 130 39 34 .05 uF +80-20%; 25 V 220 ±20% .068 uF ±10%; 100 V 130 80 pF; 250 V
C531 C532H C532HH C533H C533HH C536 C537H C537HH C538 C539 C540 C541 C542 C543 C544 C545	21D83596E10 21D84395B03 21D84395B07 21D84936A04 21D84936A07 21D84395B06 21D84395B06 21D84395B05 21D84494B26 8D83813H05 21D84494B26 23D83210A21 21D84936A06 21D84936A06 21D84494B26 21D84494B26	220 ±20% 80 pF; 250 V 60; 250 V 25 pF, 2000 V, P120 15; 2000 V; P120 150; 250 V 150; 250 V 130; 250 V 130 .068 uF ±10%; 100 V 130 15 uF +150-10%; 25 V 30 ±1.5 pF; 2000 V; P120 30 ±1.5 pF; 2000 V; P120 130 130
CR501 CR502	48C82139G01 48C82525G01	SEMICONDUCTOR DEVICE, diode; (SEE NOTE) germainium silicon

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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J501 J502 J503	28C84227B01 28C84227B01 9C84207B01	CONNECTOR, receptacle: male; coaxial; miniature type male; coaxial; miniature type female; 7-contact
L501	24C83961B01	COIL, RF: choke; consists of a ferrite core with a 3-turn winding
L502H	24C84392B03	choke; consists of a resistor (82 Ohms ±10%; 1 Watt) covered with a 6-turn winding
L502HH	24C84392B01	choke; consists of a resistor (120 Ohms ±10%; 1 Watt) covered with a 6-turn winding
L503	24C83884G03	choke; 1-1/2 turns, molded
L504	24C83961B01	choke; consists of a ferrite core with a 3-turn winding
L505	24C84392B02	choke; consists of a resistor (39 Ohms ±10%; 2 Watt) covered with a 4-turn winding
L506H L506HH	24D82723H04 24B83977B01	choke; 0.29 uH choke; 1-1/2 turns on ferrite body
L507	24C84392B04	choke; consists of a resistor (100 Ohms ±10%; 2 Watt) covered with a 4-turn winding
L508	24B83977B01	choke; 1-1/2 turns on ferrite body
L509	24B84393B02	choke; 5-1/2 turns
R501	6S124C97	RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated 100k
R503	6S124A01	10 ±5%
R504 R505 R506 R507 R508 R510 R512 R513 R514 R515	6S124C55 6S124B55 6S125C19 6S124C67 6S124B55 6S124C71 6S124B55 6S124B55 6C84232B02 6S124C49	1.8k 2.7 ±5% 56; 1/2 W 5.6k 2.7 ±5% 8.2k 2.7 ±5% 2.7 ±5% (meter shunt) 1k
T501	25C84396B01	TRANSFORMER, RF: pri: 5 turns sec: 4 windings, 1 turn each
T502	25C84818B01	pri: 2 windings, 1-3/4 turns each: sec: 2 windings; 1-3/4 turns each
T503	25B84012C01	pri: 3 windings, 1-1/2 turns each: sec: 4 turns

TLN4742A PA Hardware Kit (continuous duty)
 (p/o TLD1703A & TLD1704A)

PL-1737-A

Q501 Q502 Q503 Q504, 505	48R869622 48R869623 48R869624 48R869625	TRANSISTOR; (SEE NOTE) P-N-P; type M9622 P-N-P; type M9623 P-N-P; type M9624 P-N-P; type M9625
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NOTE:

Additional electrical components for TLN4742A are
 listed in the Power Control and Transmitter Inter-
 connect sections; hardware is listed in the Transmitter
 Hardware Kits section.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN4780A PA Heat Sink Kit (continuous duty)
 (p/o TLD1703A & TLD1704A)

PL-1738-O

C546, 547	21C84211B02	CAPACITOR, fixed; .01 uF +100-0%; 250 V
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NOTE:

Hardware for TLN4780A is listed in the Transmitter
 Hardware Kits section.

TLN5922A Input Bracket and Cable

PL-5090-O

C560, 561, 562 C565, 566	21-410115 21-84211B01	CAPACITOR, fixed: 220 pF ±20%; 500 V .001 uF; 250 V
Q509	48-869627	TRANSISTOR; (SEE NOTE) NPN; type M9627

NOTE: Cable assemblies are listed in the RF Cables section;
 additional electrical components are listed in the
 Transmitter Interconnect section; hardware is listed in
 the Transmitter Hardware Kits section.

TLN4781A Xmtr. Chassis & Heat Sink (intermittent duty)
 (p/o TLD1673A & TLD1674A)

PL-1740-B

C548	23D83210A08	CAPACITOR, fixed: 100 uF +150-10%; 25 V
C555 thru 558 C568	21C84211B01 21-82880E19	.01 uF +100-0%; 250 V 500 pF ±10%; 1000 V
Q501 Q502 Q503 Q504, 505 Q506	48R869622 48R869623 48R869624 48R869625 48R869576 or 48R869779	TRANSISTOR; (SEE NOTE) P-N-P; type M9622 P-N-P; type M9623 P-N-P; type M9624 P-N-P; type M9625 N-P-N; type M9576 N-P-N; type M9779

NOTE:

Additional electrical components for TLN4781A are
 listed in the Transmitter Interconnect section;
 hardware is listed in the Transmitter Hardware Kits
 section.

TLN5074A Terminal Bracket Kit

PL-1831-O

C555, 556	21-84211B01	CAPACITOR, fixed; .01 uF +100-0%; 250 V
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NOTE:

Hardware for TLN5074A is listed in the Transmitter
 Hardware Kits section.

Exciter Output Filter

PL-1741-O

Z501	TFD6112A	FILTER, RF: bandpass; 150.8-174 MHz
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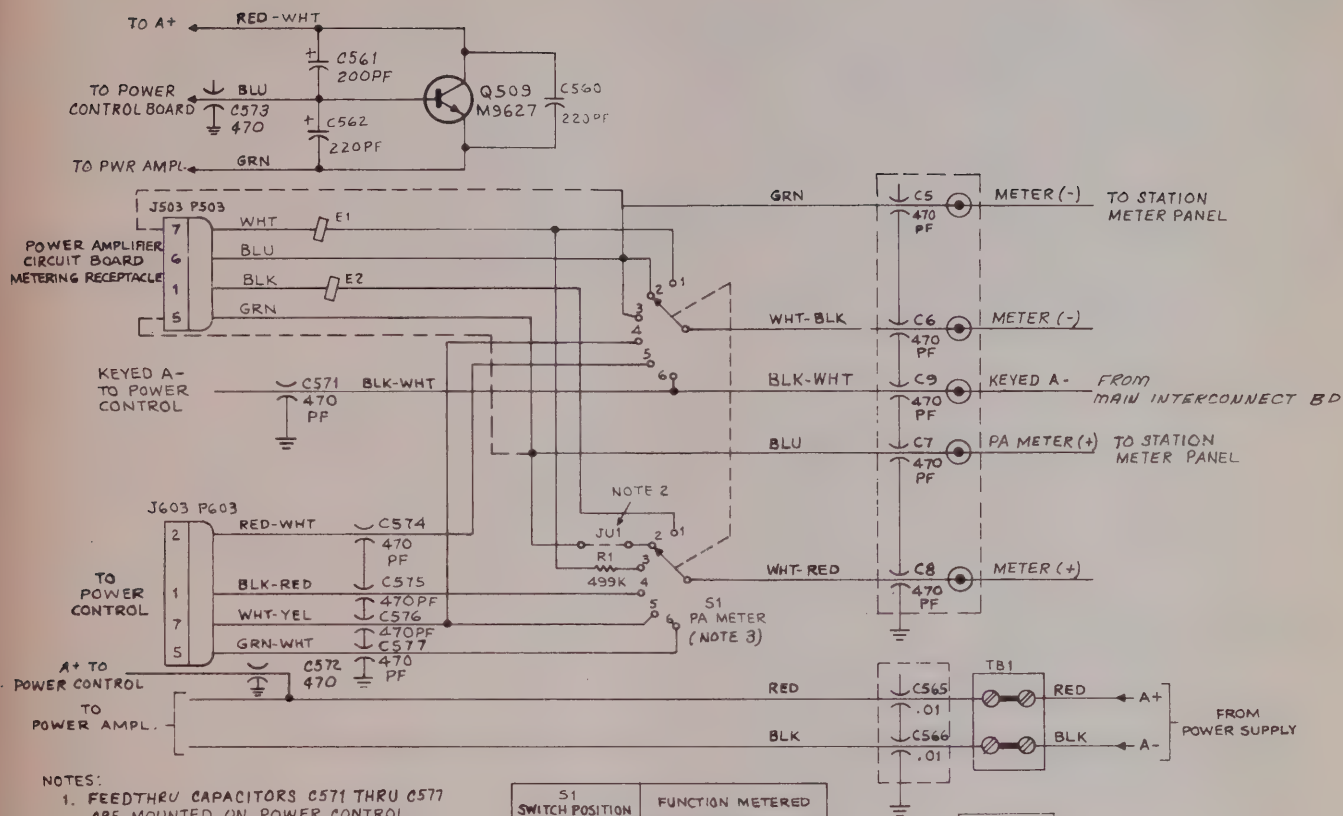
PA Output (Harmonic) Filter

PL-1742-O

Z502	TFD6102A	FILTER, RF: low-pass 150.8-174 MHz
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NOTE:

Replacement diodes and transistors must be ordered
 by Motorola part number only for optimum
 performance.



NOTES:

1. FEEDTHRU CAPACITORS C571 THRU C577 ARE MOUNTED ON POWER CONTROL BOARD MOUNTING BRACKET, ALL OTHER COMPONENTS ARE MOUNTED ON PA INPUT BRACKET
2. JU1 IS REMOVED WHEN A SECOND METER IS USED TO MEASURE PA CURRENT.
3. PA METER SWITCH S1 AND ASSOCIATED COMPONENTS (P503, P603, E1, E2, AND R1) ARE PART OF THE V VERSION AMPLIFIER MODELS AND ARE SHOWN HERE FOR REFERENCE ONLY TO PROVIDE INTERCONNECTION DATA. CONNECTIONS SHOWN IN DASHED LINES ARE USED ON UNIFIED CHASSIS MODELS.

S1 SWITCH POSITION	FUNCTION METERED
1	PA INPUT
2	FINAL PA CURRENT
3	FINAL PA VOLTAGE
4	FORWARD POWER
5	REFLECTED POWER
6	CONTROL VOLTAGE

CEPS-22932-A

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
TLN5922A Input Bracket and
Cable Assembly
Schematic Diagram
Motorola No. 63P81033E29-A
6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5922A Input Bracket & Cable Kit

PL-5180-O

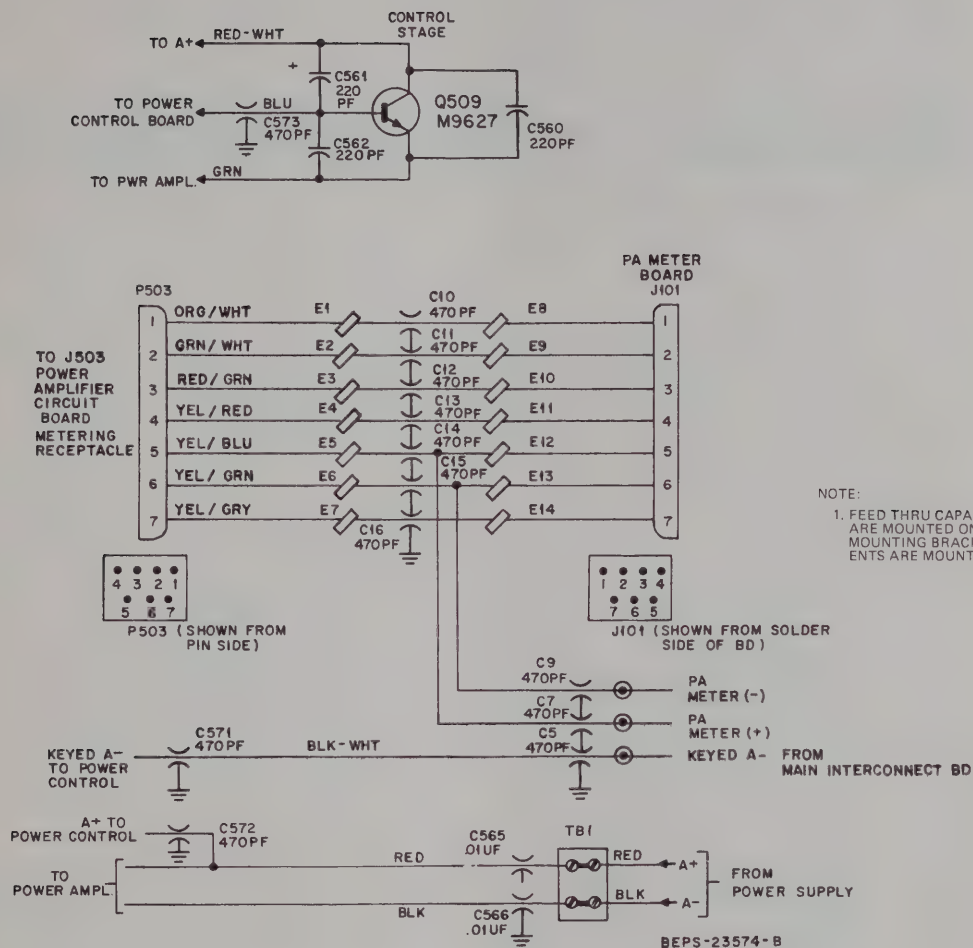
C5 thru 9 C560, 561, 562 C565, 566	21-821474 21-410115 21-84211B01	<u>CAPACITOR, fixed:</u> 470 pF $\pm 20\%$; 500 V 220 pF $\pm 20\%$; 500 V .01 uF; 250 V
Q509	48-869627	<u>TRANSISTOR; (SEE NOTE I)</u> NPN; type M9627
TB1	31-50378	<u>TERMINAL BOARD:</u> 2-terminal

NON-REFERENCED ITEMS

1-80793B63	BRACKET ASSEMBLY includes:
7-82961L01	BRACKET, input
9-84935D01	SOCKET, transistor (for Q509)
2-115968	CAPACITORS C5 thru C9 NUT, hex: 1/4-28 x 3/8 x 1/8"; 2 used
3-3360	SCREW, tapping: 6-20 x 1/2"; 2 used
3-8153	SCREW, tapping: 8-15 x 3/4"; 2 used
4-7557	WASHER, flat: .172 x .375 x .033; 2 used
4-7678	WASHER, lock: #1/4 (external tooth); 2 used
14-865875	INSULATOR, transistor
29-5223	LUG, soldering: #8L; 2 used

NOTE:

- I For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.
- II Cable assemblies for TLN5922A are listed in the RF Inter-cabling Section.



PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
TRN8012A Input Bracket and
Cable Assembly
Schematic Diagram
Motorola No. 63P81034E78-B
6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TRN8012A Input Bracket & Cable Assembly
(High Band)

PL-5338-O

C5, 7, 9 thru 16	21-821474	<u>CAPACITOR, fixed:</u> 470 pF $\pm 20\%$; 500 V
C560, 561, 562	21-410115	220 pF $\pm 20\%$; 500 V
C565, 566	21-84211B01	.01 uF; 250 V
E1 thru 14	76-83960B01	<u>FERRITE BEAD:</u> .138 OD x .118" lg.
J101	9-84207B01	<u>CONNECTOR, receptacle:</u> 7-pin
P503	28-84208B01	<u>CONNECTOR, plug:</u> 7-pin
Q509	48-869627	<u>TRANSISTOR:</u> (SEE NOTE I) NPN; type M9627
TB1	31-50378	<u>TERMINAL BOARD:</u> 2-terminal

NON-REFERENCED ITEMS

1-80798B16	BRACKET ASSEMBLY includes:
7-84234L01	BRACKET, mounting
9-84935D01	SOCKET, transistor
43-82253C07	BUSHING, threaded: 2 used
	CAPACITORS C5, C6, C9- C16, C571 & C573
1-80792B71	CIRCUIT BOARD ASSEMBLY includes:
1-80792B83	CIRCUIT BOARD SUBASSEM- BLY includes:
39-10184A10	CONTACT, male: 7 used
	CONNECTOR J101
2-115968	NUT, hex: 1/4-28 x 3/8 x 1/8"; 2 used
3-3360	SCREW, tapping: 6-20 x 1/2"; 2 used
3-8153	SCREW, tapping: 8-15 x 3/4"; 2 used
3-134184	SCREW, tapping: 4-40 x 5/16"; 2 used
4-7557	WASHER, flat: .172 x .375 x .033"; 2 used
4-7678	WASHER, lock: #1/4 (external tooth); 2 used
14-865875	INSULATOR, transistor
29-5223	LUG, soldering: #8L; 2 used
42-84834G01	COVER, plug

NOTES:

- I For optimum performance, replacement transistors must be ordered by Motorola part numbers.
- II RF Cable assemblies for TRN8012A are listed in the RF Interconnecting Section.

TLN4741A Hardware Kit (100 W)

TLN4742A Hardware Kit (60 W)

PL-5344-O

C571, 572, 573	21-821474	<u>CAPACITOR, fixed:</u> 470 pF $\pm 20\%$; 500 V
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NOTE:

Additional electrical components for TLN4741A & TLN4742A are listed in the 60- & 100-Watt Power Amplifier Board sections; hardware is listed in the Transmitter hardware kits section.

60 W POWER AMPLIFIER

TLD5740A SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE
TLD5743A	150.8-162 MHz
TLD5744A	162-174 MHz

TECHNICAL CHARACTERISTICS*

RF Power In	400 mW
Input Impedance	50 ohms
RF Power Out	60 watts (50 watts optional)
Output Impedance	50 ohms
Power Requirements	13.0 volts @11 amps

*All values are typical

1. DESCRIPTION

Motorola's "Micor" power amplifier boards provide the following features:

- A minimum of 60 W rf output (50 W optional).
- All circuitry contained on one double-sided circuit board.
- Power transistors (and control stage transistor in continuous duty stations) mounted directly to (but electrically isolated from) the heat sink.

- RF connections made through two coaxial connections which plug directly into the input and output.

- DC power supplied via two feedthrough capacitors that also provide filtering.

- Input, output, and most other critical interstage matching is accomplished by the use of rf transformers wound around ferrite cores. Only one tuning adjustment is required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.



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Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

- One metering socket which is accessible from the component side of the circuit board allows four major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

- Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

- Diode protection against reverse polarity voltage (board mounted diode).

- Output protection provided by a control stage transistor driven by the power control circuit (Controls gain of the first stage). In intermittent duty stations, a single-wire provides interconnection between power control and PA circuitry. In continuous duty stations, three wires provide this interconnection.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifiers requires a 400 mW rf input from the exciter board. This input is passed through a bandpass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the control stage transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain-controlled amplifier is passed through a fixed-tuned broadband, matching network and applied to the pre-driver stage. A parallel capacitor network couples the output of the pre-driver to the base of the driver stage. The output of the driver stage is split by

a transformer to drive the push-pull final power amplifier stage. The output from the final stage is stepped up in impedance by a ferrite transformer to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the pre-driver stage. Pin 3 permits observation of the drive output of the pre-driver stage and an indication of the operation of the driver stage. Pin 4 reflects the drive signal and operation of the two push-pull power amplifier stages. Pin 5 permits observation of the collector currents of the push-pull final amplifier stages. Reference position A on a Motorola Portable Test Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, 3, and 4 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot".

This section of the manual provides the maintenance shop procedures for the PA board.

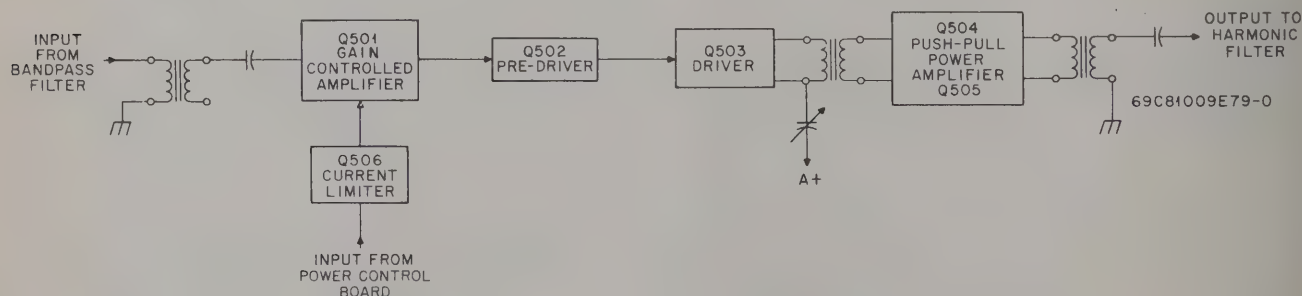


Figure 1. Block Diagram

It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with optional built-in station metering or a Motorola Portable Test Set, a vom, a complete set of performance tests, and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in the transmitter for testing to provide the necessary power, ground, control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA.

(1) Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation. Optional built-in station metering, when incorporated, takes the place of the portable test set.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however, a low impedance meter is acceptable for dc voltage measurements only.

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

c. Metering

The PA is equipped with a metering receptacle which allows five major test points to be measured. PA metering can be made at each of the five test points by merely rotating a selector switch on the built-in station metering kit or on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

(1) Using the Optional Built-In Station Meter

This procedure applies to intermittent duty stations. Continuous duty stations with built-in station metering are similar, except these stations measure only exciter output (PA input), PA current and PA voltage of the final devices.

(a) The entire transmitter is necessary for testing PA boards including the power board for proper control.

(b) The output of the station must be terminated in one of three types of loads:

-- The antenna load.

-- A dummy load such as Motorola's T1013A RF Load Resistor.

-- An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

(c) Turn the station ON.

(d) With the meter panel selector switch set to the XMIT position and the transmitter chassis selector switch set to position 1, key the transmitter and observe the meter. Unkey the transmitter. Set the transmitter chassis selector switch to positions 2, 3, and 4, keying the transmitter and observing the meter reading for each position. On multi-frequency stations, repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad is given in the MINIMUM PA METER READINGS table.

(2) Using the Portable Test Set

To make the measurements, the portable test set must be connected to the station as follows:

(a) Set the function selector switch of the portable test set to the XMTR position.

(b) Set the meter reversing switch of the test set to the METER REV position.

(c) Set the selector switch of the test set to position 1 and reference position A.

(d) Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

(e) Connect the red "control" plug of the adapter cable to the control receptacle on the

local or remote control chassis circuit board. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

(f) The entire transmitter is necessary for testing PA boards including the power control board for proper control.

(g) The output of the station must be terminated in one of three types of loads:

-- The antenna load.

-- A dummy load such as Motorola's T1013A RF Load Resistor.

-- An RF Wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

(h) Turn the station ON.

(i) Key the transmitter with the XMTR ON button on the test set. Observe the meter. Unkey the transmitter.

(j) Set the selector switch to positions 2, 3, and 4; then switch to reference position B and meter position 5 respectively, keying the transmitter and observing the meter reading for each. On multi-frequency stations repeat the readings for each frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows.

Each time maintenance is performed on the PA the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the station as a whole. Before checking power output:

(a) The exciter board should be known to be functioning normally.

(b) The power control board should be known to be functioning normally.

(c) Antenna switch should be known to be operating normally (base stations only).

(2) Key the transmitter and observe power out, which should be 60 watts.

(3) If necessary, adjust POWER SET control for rated power output.

CAUTION

The PA shield must always be in place during operation of the station and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control stage transistor mounted on the inner wall) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA deck, several checks can be made prior to extensive troubleshooting.

a. Visually

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for the proper voltage at the collector of each transistor. Certain defects such as broken plating, broken leads, etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, a logical

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	PORT. TEST SET REF. SW.	STATION METERING POL. SW.	MINIMUM METER READING	CIRCUIT METERED	IF LOW, THE DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	REV	15 uA	RF output of exciter and collector voltage of controlled amplifier (PA input)	Exciter, controlled amplifier, or current limiter
2	A	REV	5 uA	Controlled amplifier output	Controlled amplifier or pre-driver
3	A	REV	10 uA	Pre-driver output	Pre-driver or driver
4	A	REV	13 uA	Driver output & power amplifier input	Driver or power amplifier
5	B	REV	25 uA min. 40 uA max.	Final amplifier output current	Final amplifier
6 (or 25 V See Note)	B	FWD	12 V (0-30 V scale)	Final amplifier voltage	Final amplifier A+ or A-input

NOTE: When using optional built-in station metering, the two voltage probes are used to measure PA voltages.

troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting chart summarizes these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources when an optional positive ground converter is used).

CAUTION

Due to the voltage requirements of PNP transistors, all "rf ground" plating is A+ and is "hot" with respect to chassis ground in negative ground applications. Because of this, caution should be used to prevent connection to "ground" plating on the PA board to chassis ground, either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

5. PA REPAIR NOTES

a. Resistance Measurement of Transistors In Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at the base, emitter and

collector, BOTH devices should be measured individually when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistors. The nuts (for the mounting screws) on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type desoldering device.

(3) Gently lift each tab, one at a time while applying heat.

(4) When all four tabs are loose from the board carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads face the proper direction. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10, or RX100 scale (preferably RX10 if available).

(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base, no indication (very high impedance) should

be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement.)

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure a good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedures for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10, or RX100 scale (preferably RX10 if available).

(2) Measure the resistance from lead to lead as described:

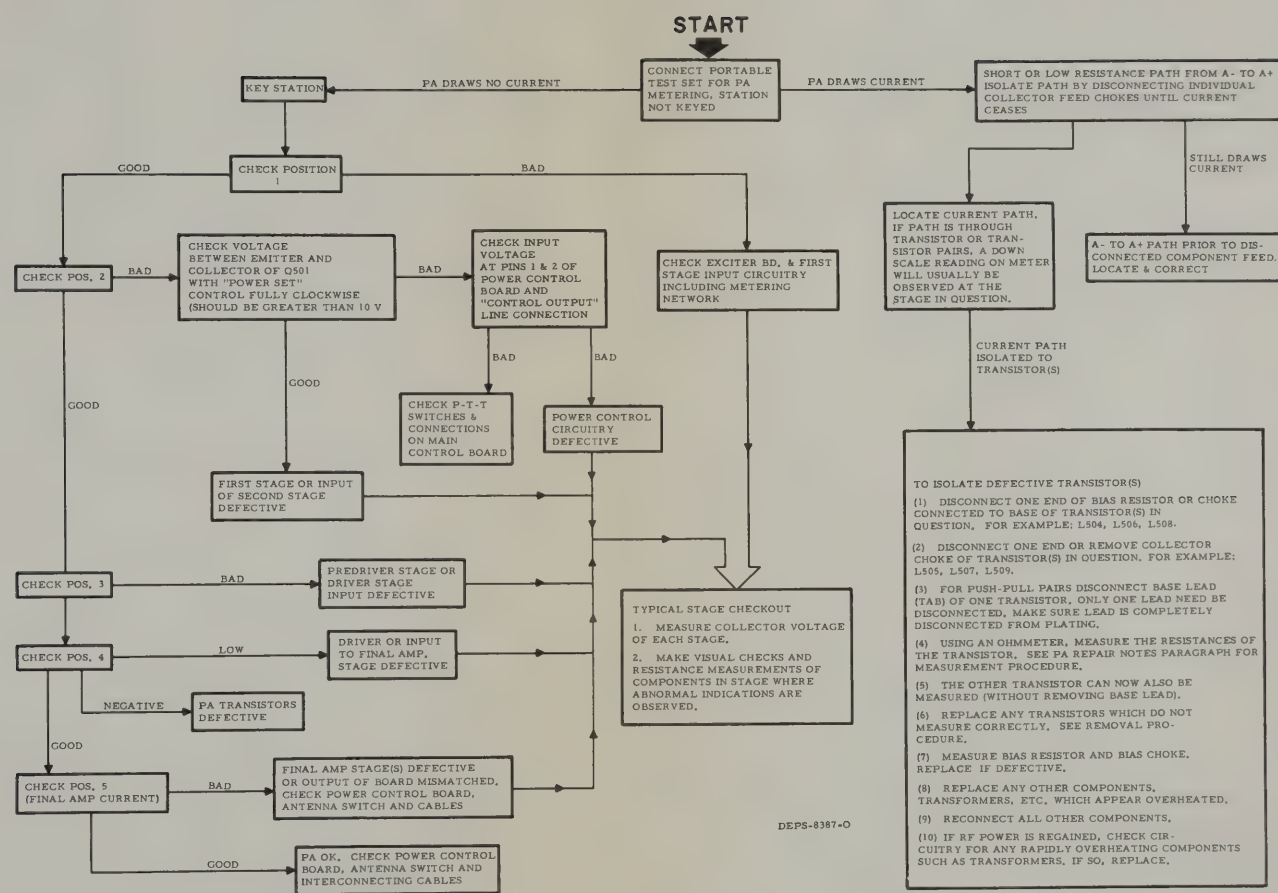
(a) With the positive probe on the base, no indication (very high impedance) should

be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement.)

(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.



ALIGNMENT PROCEDURE

EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

1. Radio transmitters may be tuned or adjusted only by a duly licensed radiotelephone operator's license or by person holding a license of equivalent grade.
2. The power input to the final radio frequency stage of a transmitter must be in accordance with the current station authorization. This power input shall be:
 - a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter wiring.
 - c. At intervals not to exceed one year.
3. Frequency and deviation of a transmitter must be in accordance with the current station authorization. This frequency and deviation shall be:
 - a. When it is initially installed.
 - b. When any change is made in the transmitter wiring or modulation characteristics.
 - c. At intervals not to exceed one year.

ST

STAGE AND PROCEDURE

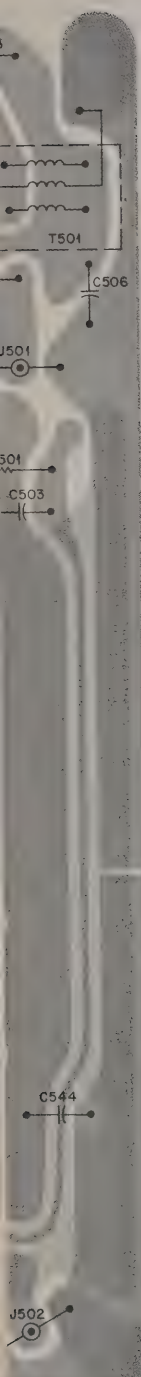
	Align the exciter.
	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
	PA PRE-ALIGNMENT - Set C501 fully clockwise.
ER	OUTPUT - Gradually rotate the POWER SET control until an initial meter 5 reading is observed. Do not readjust POWER SET control. If this indication is less than 50 uA, proceed with step 5. If greater than 50 uA, tune C501 for an on-scale reading.
ER	OUTPUT - Without exceeding rated power output of 60 watts on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
	PA DRIVER OUTPUT - Tune C501 for minimum meter 5 reading.
ER	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 5 and 6). Check meter reading, it must not exceed 50 uA.
	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 10 A. Therefore, to measure the final collector current (I_C) in amperes, take 1/5 the meter reading.
	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_C). V_C is the meter 6 reading (0-30 V scale on test set, 25 V full scale on built-in metering).
	FINAL INPUT POWER (P_{in}) - $P_{in} = V_C I_C$ and should be less than 120 watts.

Power Amplifier Alignment Procedure
Motorola No. PEPS-24480-O
6/20/80-PHI

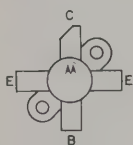
EXCERPTS FROM FCC REGULATIONS

- FCC Regulations state that:
- Radio transmitters may be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
- The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization. This power input shall be measured and the results recorded:
- a. When the transmitter is initially installed.
 - b. When any change is made in the transmitter which may increase the power input.
 - c. At intervals not to exceed one year.
- Frequency and deviation of a transmitter must be checked:
- a. When it is initially installed.
 - b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
 - c. At intervals not to exceed one year.

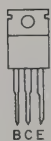
STEP	METERING PLUG LOCATION	PORTABLE TEST SET		OPTIONAL BUILT-IN METERING		ADJUST	STAGE AND PROCEDURE
		TEST SET SWITCH POSITION	ADAPTER CABLE SWITCH POSITION	METER SELECTOR SWITCH	POLARITY SWITCH		
1	--	--	--	--	--	--	Align the exciter.
2	--	--	--	--	--	--	For complete power amplifier tune-up, proceed to step 3. To check alignment, go to step 7.
3	--	--	--	--	--	C501	PA PRE-ALIGNMENT - Set C501 fully clockwise.
4	POWER CONTROL BOARD	5	METER REV. REF B	PWR CONT 5	FWD	POWER SET C501	OUTPUT - Gradually rotate the POWER SET control until an initial meter 5 reading is observed. Do not readjust POWER SET control. If this indication is less than 50 uA, proceed with step 5. If greater than 50 uA, tune C501 for an on-scale reading.
5	POWER CONTROL BOARD	Wattmeter or 1 & 5	METER REV. REV A	PWR CONT 1	FWD	POWER SET	OUTPUT - Without exceeding rated power output of 60 watts on wattmeter or calibration label value on meter 1, adjust the POWER SET control for rated power or until no further increase in power output is observed. If PA meter 5 is greater than 25 uA, adjust POWER SET counterclockwise (if less than 15 uA, adjust POWER SET clockwise) until meter reading is between 15 and 25 uA.
6	POWER CONTROL BOARD	5	METER REV. REF B	PWR CONT 5	FWD	C501	PA DRIVER OUTPUT - Tune C501 for minimum meter 5 reading.
7	POWER CONTROL BOARD	Wattmeter or 1 5	METER REV. REF A METER REV. REF B	PWR CONT 1 PWR CONT 5	FWD FWD	POWER SET	OUTPUT - Adjust the POWER SET control for rated power output and repeat step 6 (if rated power cannot be attained, repeat steps 5 and 6). Check meter reading, it must not exceed 50 uA.
8	PA	5	METER REV. REF B	POWER AMP 5	REV	--	FINAL COLLECTOR CURRENT - The relationship between the meter reading and the actual current being measured is 50 uA = 10 A. Therefore, to measure the final collector current (I _C) in amperes, take 1/5 the meter reading.
9	PA	6	METER REV. REF B	25 V (use voltage probes)	FWD	--	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V _C). V _C is the meter 6 reading (0-30 V scale on test set, 25 V full scale on built-in metering).
10	--	--	--	--	--	--	FINAL INPUT POWER (Pin) - Pin = V _C I _C and should be less than 120 watts.



TRANSISTOR DETAILS



TOP VIEW



FRONT VIEW

DEPS-6435-B
MPS-4431-A
DEPS-24329-0



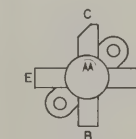
SHOWN FROM COMPONENT SIDE

● COMPONENT SIDE
○ SOLDER SIDE

8D-DEPS-6435-B
8D-DEPS-6
OL-DEPS-24329-0

* THESE TRANSISTOR LEADS ARE
CONNECTED TO ONLY THE COMPONENT
SIDE OF THE BOARD.

TRANSISTOR DETAILS

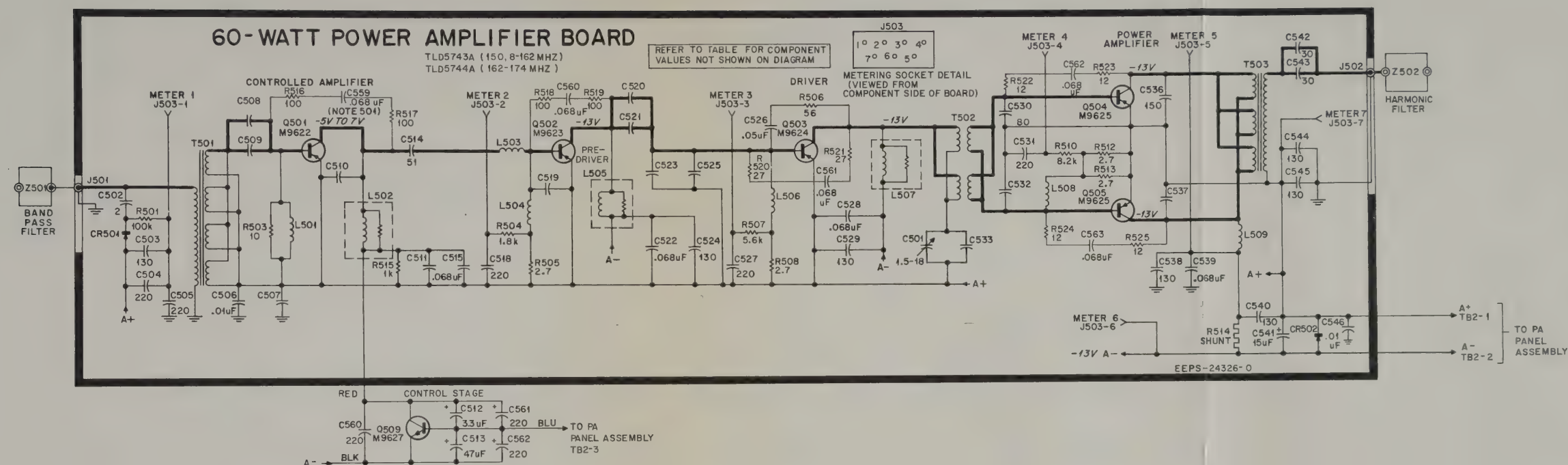


TOP VIEW



FRONT VIEW

60-Watt Power Amplifier
Circuit Board Detail
Motorola No. PEPS-24481-O
6/20/80-PHI



POWER AMPLIFIER

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED: CAPACITOR VALUES ARE IN PICOFARADS.

NEPS-24328-O

PA COMPONENT VALUES

REFERENCE SYMBOL	150.8-162 MHz	162-174 MHz
C507	390	39
C508	51	60
C509	49	34
C510	15	13
C511	130	NOT USED
C519	91	75
C520	39	34
C521	39	30
C523	75	60
C525	39	34
C532	80	60
C533	25	15
C537	150	130
L502	24-843 92B03	24-843 92B01
L506	0.29 uH	1-1/2 TURNS

NEPS-24327-O

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
60-Watt Power Amplifier
Schematic Diagram
Motorola No. 63P81036 E21-O
6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TRN6969A Hardware & Heat Sink Kit,
 60 W PA

PL-5509-O

C546	21-84211B02	<u>CAPACITOR, fixed: feedthru type:</u> .01 uF; 250 V
Q501	48-869622	TRANSISTOR: (SEE NOTE)
Q502	48-869623	PNP; type M9622
Q503	48-869624	PNP; type M9623
Q504, 505	48-869625	PNP; type M9624
		PNP; type M9625
NON-REFERENCED ITEMS		
	3-114406	SCREW, cap: 4-40 x 5/16"; 10 used
	3-134184	SCREW, tapping: 4-40 x 5/16" (w/internal lockwasher); 4 used
	3-134212	SCREW, tapping: 4-40 x 5/16" (w/external lockwasher); 8 used
	3-139000	SCREW, machine: 10-32 x 1-1/2"; 2 used
	4-115362	WASHER, lock: #10 (external tooth) 2 used
	4-801846	WASHER, insulating
	7-83269L01	BRACKET, hinge
	14-84020C01	INSULATOR, circuit board
	26-84170G02	HEAT SINK
	42-82234G01	RING, cord: 2 used

TRN6444A Resistor-Capacitor Kit

PL-5510-O

C559 thru 563	8-83813H05	<u>CAPACITOR, fixed:</u> .068 uF ±10%; 100 V
R516 thru 519	6-125C25	<u>RESISTOR, fixed: ±10%; 1/2 W:</u> 100
R520, 521	6-125C11	27
R522 thru 525	6-125C03	12

Exciter Output Filter

PL-1741-O

Z501	TFD6112A	<u>FILTER, RF: bandpass;</u> 150.8-174 MHz
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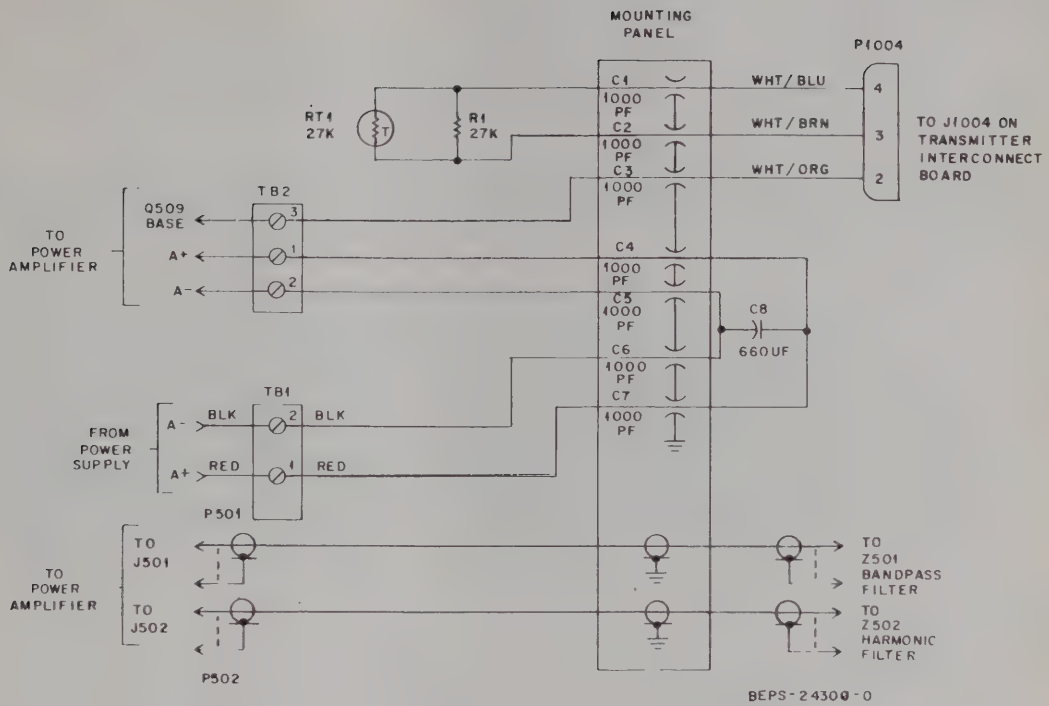
PA Output (Harmonic) Filter

PL-1742-O

Z502	TFD6102A	<u>FILTER, RF: low-pass</u> 150.8-174 MHz
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NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



PARTS LIST SHOWN ON
 BACK OF THIS DIAGRAM
 TRN6971A and TRN6973A
 PA Panel Assembly
 Schematic Diagram
 Motorola No. 63P81036E11-O
 6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

LEGEND:
H = (150, 8-162 MHz)
HH = (162-174 MHz)

TLD5743A Power Amplifier Board (150, 8-162 MHz)
TLD5744A Power Amplifier Board (162-174 MHz)

PL-5508-O

NOTE		
This parts list covers two models of the Power Amplifier Board. Where differences exist a letter code is added to the reference symbol to indicate the applicable unit.		
C501	20-83201B07	CAPACITOR, fixed; pF; ±5%; 500 V; unless otherwise stated
C502	21-83406D52	variable; 1.5-18; 100 V
C503	21-84494B26	130
C504	21-83596E10	220 ±20%
C505	21-83596E10	220 ±20%
C506	21-82428B59	.01 uF +80-20%; 200 V
C507H	21-84494B18	390
C507HH	21-84494B24	39
C508H	21-84494B01	51
C508HH	21-84494B35	60
C509H	21-84494B25	49
C509HH	21-84494B30	34
C510H	21-84494B38	15
C510HH	21-84494B36	13
C511H	21-84494B26	130
C511HH		NOT USED
C512	23-83214C17	3.3 uF ±20%; 25 V
C513	23-83214C10	47 uF ±20%; 6 V
C514	21-84494B01	51
C515	8-83813H05	.068 uF ±10%; 100 V
C518	21-83596E10	220 ±20%
C519H	21-84494B52	91
C519HH	21-84494B31	75
C520H	21-84494B24	39
C520HH	21-84494B30	34
C521H	21-84494B24	39
C521HH	21-84494B33	30
C522	8-83813H05	.068 uF ±10%; 100 V
C523H	21-84494B31	75
C523HH	21-84494B35	60
C524	21-84494B26	130
C525H	21-84494B24	39
C525HH	21-84494B30	34
C526	21-82372C04	.05 uF +80-20%; 25 V
C527	21-83596E10	220 ±20%
C528	8-83813H05	.068 uF ±10%; 100 V
C529	21-84494B26	130
C530	21-84395B03	80; 250 V
C531	21-83596E10	220 ±20%
C532H	21-84395B03	80; 250 V
C532HH	21-84395B07	60; 250 V
C533H	21-84936A04	25; 2000 V, P120
C533HH	21-84936A07	15; 2000 V; P120
C536	21-84395B06	150; 250 V
C537H	21-84395B06	150; 250 V
C537HH	21-84395B05	130; 250 V
C538	21-84494B26	130
C539	8-83813H05	.068 uF ±10%; 100 V
C540	21-84494B26	130
C541	23-83210A21	15 uF +150-10%; 25 V
C542	21-84936A06	30 ±1.5 pF; 2000 V; P120
C543	21-84936A06	30 ±1.5 pF; 2000 V; P120
C544	21-84494B26	130
C545	21-84494B26	130
SEMICONDUCTOR DEVICE, diode; (SEE NOTE)		
CR501	48-82139G01	germanium
CR502	48-82525G13	silicon
	or 48-82525G01	
CONNECTOR, receptacle: phono		
J501, 502	9-84231B03	female; 7-contact
J503	9-84207B01	
COIL, RF:		
L501	24-83961B01	choke; consists of a ferrite core with a 3-turn winding
L502H	24-84392B03	choke; consists of a resistor (82 ohms ±10%; 1 watt) covered with a 6-turn winding

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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L502HH	24-84392B01	choke; consists of a resistor (120 ohms ±10%; 1 watt) covered with a 6-turn winding
L503	24-83884G03	choke; 1-1/2 turns, molded
L504	24-83961B01	choke; consists of a ferrite core with a 3-turn winding
L505	24-84392B02	choke; consists of a resistor (39 ohms ±10%; 2 watt) covered with a 4-turn winding
L506H	24-82723H04	choke; 0.29 uH
L506HH	24-83977B01	choke; 1-1/2 turns on ferrite body
L507	24-84392B04	choke; consists of a resistor (100 ohms ±10%; 2 watt) covered with a 4-turn winding
L508	24-83977B01	choke; 1-1/2 turns on ferrite body
L509	24-84393B02	choke; 5-1/2 turns
R501	6-124D97	RESISTOR, fixed; ±10%; 1/4 W; unless otherwise stated
R503	6-124A01	100k
R504	6-124C55	10 ±5%
R505	6-124B55	1.8k
R506	6-125C19	2.7 ±5%
R507	6-124C67	56; 1/2 W
R508	6-124B55	5.6k
R510	6-124C71	2.7 ±5%
R512	6-124B55	8.2k
R513	6-124B55	2.7 ±5%
R514	6-84232B02	2.7 ±5%
R515	6-124C49	(mter shunt) 1k
T501	25-84396B01	TRANSFORMER, RF: pri: 5 turns
T502	25-84818B01	sec: 4 windings, 1 turn each
T503	25-84012C01	pri: 2 windings, 1-3/4 turns each; sec: 2 windings; 1-3/4 turns each
		pri: 3 windings, 1-1/2 turns each; sec: 4 turns

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

TRN6969A Hardware & Heat Sink Kit, 60 W PA PL-5509-O

C546	21-84211B02	CAPACITOR, fixed; feedthru type: .01 uF; 250 V
Q501	48-869622	TRANSISTOR: (SEE NOTE)
Q502	48-869623	PNP; type M9622
Q503	48-869624	PNP; type M9623
Q504, 505	48-869625	PNP; type M9624
		PNP; type M9625
NON-REFERENCED ITEMS		
	3-114406	SCREW, cap: 4-40 x 5/16"; 10 used
	3-134184	SCREW, tapping: 4-40 x 5/16" (w/internal lockwasher); 4 used
	3-134212	SCREW, tapping: 4-40 x 5/16" (w/external lockwasher); 8 used
	3-139000	SCREW, machine: 10-32 x 1-1/2"; 2 used
	4-115362	WASHER, lock: #10 (external tooth) 2 used
	4-801846	WASHER, insulating
	7-83269L01	BRACKET, hinge
	14-84020C01	INSULATOR, circuit board
	26-84170G02	HEAT SINK
	42-82234G01	RING, cord: 2 used

TRN6444A Resistor-Capacitor Kit PL-5510-O

C559 thru 563	8-83813H05	CAPACITOR, fixed: .068 uF ±10%; 100 V
R516 thru 519	6-125C25	RESISTOR, fixed: ±10%; 1/2 W: 100
R520, 521	6-125C11	27
R522 thru 525	6-125C03	12

Exciter Output Filter PL-1741-O

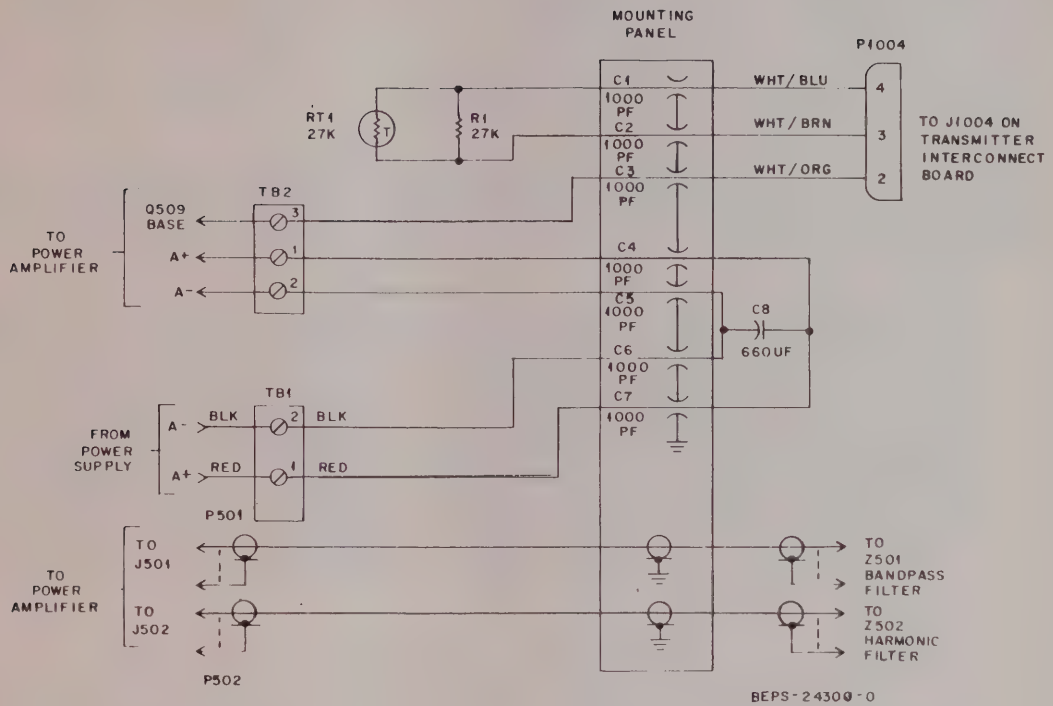
Z501	TFD6112A	FILTER, RF: bandpass; 150.8-174 MHz
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PA Output (Harmonic) Filter PL-1742-O

Z502	TFD6102A	FILTER, RF: low-pass 150.8-174 MHz
------	----------	------------------------------------

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



PARTS LIST SHOWN ON
 BACK OF THIS DIAGRAM
 TRN6971A and TRN6973A
 PA Panel Assembly
 Schematic Diagram
 Motorola No. 63P81036E11-O
 6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TRN6971A Panel Assembly, PA

TRN6973A Panel Assembly, PA

PL-5511-O

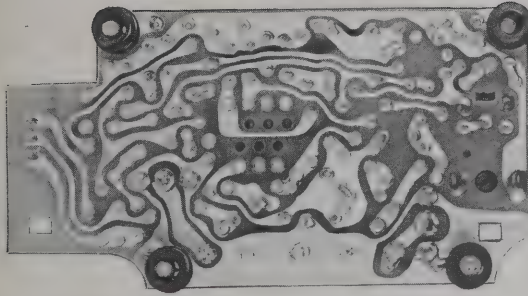
NOTE

This parts list covers two models of the PA Panel Assembly. Where differences exist the model number of the applicable unit is given in the Description column.

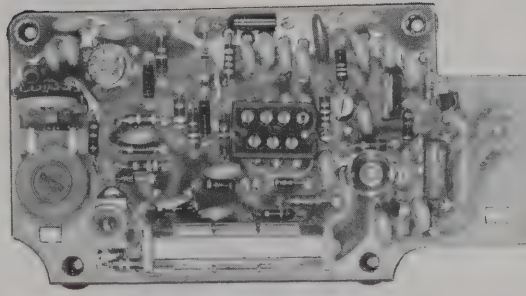
C1 thru 7 C8	21-82812H03 23-83210A22	<u>CAPACITOR, fixed:</u> 1000 pF +100-0%; 500 V 660 uF +150-10%; 25 V
P501, 502 P1004	28-82331G02 - 15-83498F07 29-83499F01 46-84549F01	<u>CONNECTOR, plug:</u> phono includes: HOUSING, connector CONTACT, terminal: 3 used PLUG, polarizing
R1	6-124C83	<u>RESISTOR, fixed:</u> 27k ±10%; 1/4 W (TRN6971A only)
RT1	6-867628	<u>THERMISTOR:</u> 194k @ 25°C
TB1 TB2	31-83272L01 31-84094L01	<u>TERMINAL BOARD:</u> 2-terminal 3-terminal
NON-REFERENCED ITEMS		
	1-80797B33 42-10217A02	CABLE ASSEMBLY includes: STRAP, tie: .091 x 3.62"; 2 used CONNECTOR P1004
	1-80797B36 64-83271L01	PANEL ASSEMBLY includes: PANEL, mounting CAPACITORS C1 thru C7
	1-80797B38	CABLE ASSEMBLY, PA Input includes:
	30-83794C01	CABLE, coaxial: 15-1/2" used CONNECTOR P501
	1-80797B39	CABLE ASSEMBLY, PA Output includes:
	30-83794C01	CABLE, coaxial: 14" used CONNECTOR P502
	3-134184	SCREW, tapping: 4-40 x 5/16" 2 used
	3-134268	SCREW, tapping: 4-40 x 7/16" 2 used
	3-138162	SCREW, tapping: 4-40 x 3/8"; 4 used
	28-82331G02	CONNECTOR, plug: phono; 2 used
	30-858552	CABLE, battery: #12 (black); 7" used
	30-858553	CABLE, battery: #12 (red); 6.5" used
	42-84284B01	RETAINER, screw: 4 used

POWER CONTROL BOARD

MODELS TLD8610A & TLD8620A
TLD8610AV & TLD8620AV
& TLD5960A



TOP VIEW



BOTTOM VIEW

FAEPS-6127-A

MODEL TABLE

MODEL	POWER RANGE
TLD8610A & TLD8610AV	60 W
TLD8620A & TLD8620AV	90/110 W Intermittent
TLD5960A	100 W Continuous

1. DESCRIPTION

The solid-state power control board provides regulation and protection for the rf transistors. One model is used with all 60-watt stations-- the other model is used with 100 -watt continuous duty stations and 90 or 110-watt intermittent duty stations. The following four functions are provided by the circuitry.

--Power Leveling - The board permits the adjustment of the output of the power amplifier to the proper level and then maintains that level of output regardless of power or supply voltage fluctuations as long as the gain of the power amplifier is equal to, or above, the preset level.

--VSWR Protection - A voltage standing wave ratio (VSWR) detector operates during transmitting periods to prevent over-dissipation of the final amplifier transistors should a fault occur in the antenna circuit. The circuitry compares power reflected from the antenna circuit to forward (output) power. When this ratio exceeds a predetermined amount, the output of the circuit lowers the power output of the power amplifier.

--Temperature Protection (Intermittent Only) -- A portion of the circuitry continually monitors heat sink temperature. When a temperature of approximately 80°C is reached, the power control board begins to reduce the power amplifier output to prevent damage to the final stage

POWER CONTROL BOARD



MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

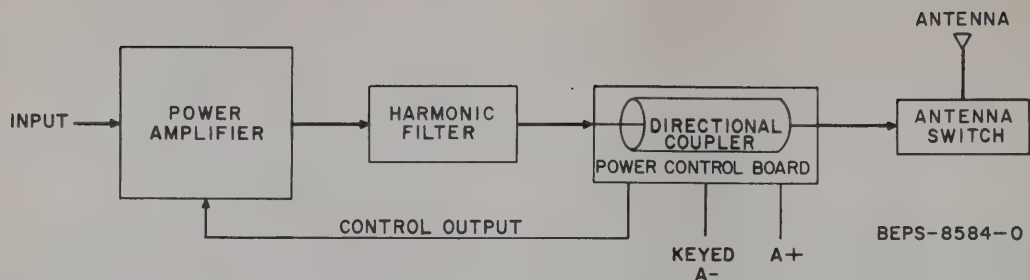


Figure 1.
Loop Block Diagram

power transistors. Any further increase in heat sink temperature will cause a correspondingly greater decrease in power output. A reduced power output level will be maintained until the heat sink temperature drops below 80°C . Thermal protection is not needed on the continuous duty version due to the large heat exchanger used.

--Forward and Reverse Power Metering--
Metering points on the board provide a means of monitoring the amount of forward (output) and reflected (reverse) power in the load system.

The power control board is constructed on a single circuit board which is easily removed and replaced. All external connections are made by two coaxial connectors (input and output for the dual directional coupler) and three pins which plug into the control board. All metering points and the single adjustment point are accessible from the plating side of the board.

2. FUNCTIONAL OPERATION

Refer to the loop block diagram, Figure 1. The circuitry operates as a control loop which continually monitors the output from the final stages of the transmitter power amplifier and controls that output by regulating the gain of the first stage of the power amplifier.

Refer to the block diagram, Figure 2. The output of the integrated circuit differential amplifier, amplified by the dc amplifier is the controlling input to the power amplifier board.

The output of the differential amplifier is determined by the potentials present on the non-inverting (+) and inverting (-) inputs. These potentials are developed by the power control board circuitry in the following manner.

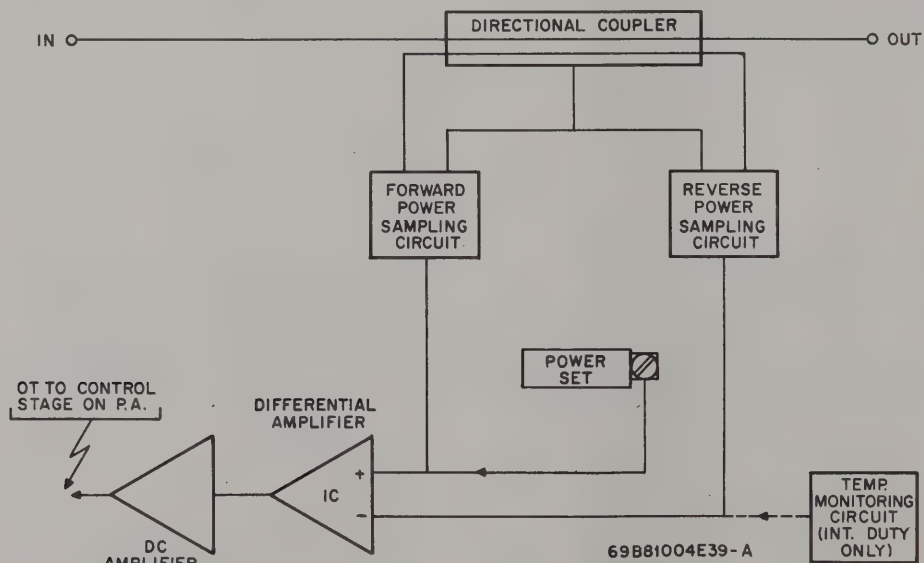


Figure 2.
Power Control Board Block Diagram

When the impedances of the antenna circuitry (load) and the power amplifier are matched (a VSWR of 1:1), and the heat sink temperature is below 80°C (for intermittent duty stations), a bias voltage produced by the dc reference bias circuitry is placed on the inverting input (also called the "reference input") of the differential amplifier (see Figure 5).

When the transmitter is keyed, the forward (output) power from the final stages of the power amplifier is fed through the directional coupler to the antenna circuit. This flow of power is sampled by the forward power sampling circuitry and places a bias, proportional to the forward power, on the non-inverting input (pin 5) of the differential amplifier. The POWER SET potentiometer is then adjusted, changing the potential on the non-inverting input. As this voltage changes, relative to the reference input voltage, the output of the differential amplifier changes, in turn changing the loop control level and therefore the output of the power amplifier.

Once the power has been set to the proper level, any change in the output power will be instantly corrected by the circuitry. If the power increases, the increase causes the differential amplifier output voltage to increase, decreasing the output from the dc amplifier which decreases the gain of the power amplifier until the output returns to the preset level. A decrease in transmitter power amplifier output causes the reverse action.

Any power reflected back from the antenna circuit is detected by the reverse power sampling circuit. Reverse power causes a negative current to flow, which, in turn, decreases the potential on the reference input of the differential amplifier. Therefore, increasing levels of reflected power will cause the transmitter power output to be decreased to a safe level.

On intermittent duty stations, temperature increases detected by the temperature monitoring circuit will also decrease the reference level at the inverting input of the differential amplifier, reducing the output power as the heat sink temperature increases above a safe operating point for the power transistors. The higher the temperature, the more the decrease in power out. If the output has been reduced due to temperature, the VSWR circuit becomes more sensitive to reverse power, thus providing further protection for the rf power amplifier transistors.

3. CIRCUIT DESCRIPTION

a. Bias Circuitry

Since the power control board has the capability to regulate the output of the transmitter power amplifier from a completely cut-off state to above the rated output power, a definite controlled output level is necessary whenever the transmitter is keyed. The desired controlled output level is determined by bias voltages present on the inverting and non-inverting inputs of the differential amplifier IC601 (see Figure 3.). Under

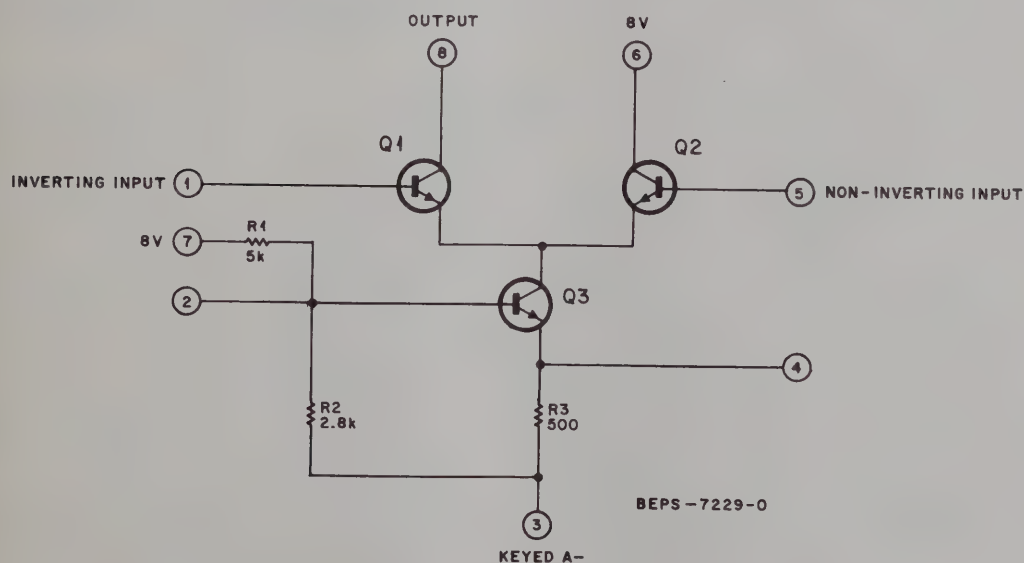


Figure 3.
IC601 Schematic Diagram

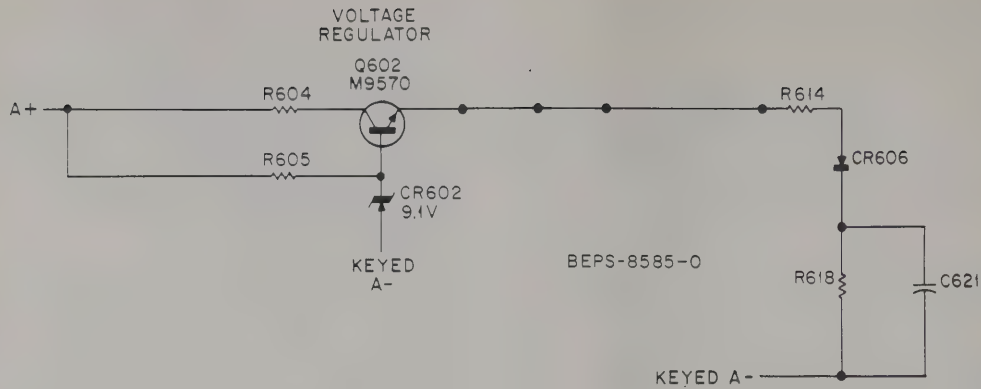


Figure 4.
Voltage Regulator and Main Divider Line

normal operating conditions (1:1 VSWR; 100% rated power out and normal heat sink temperature on intermittent duty stations) the bias on the differential amplifier inputs are developed as described in the following paragraphs.

(1) Voltage Regulator and Main Divider Line

Refer to Figure 4. The A+ supply to the board is regulated by a series regulator circuit providing a nominal voltage of 8.0 volts. The Zener diode holds the base of the series pass transistor at a fixed potential. The series pass transistor operates as a variable resistor to hold the input to the reference circuitry constant.

(2) Reference Bias Circuit

Refer to Figure 5. The reference bias is developed (with a 1:1 VSWR and normal heat sink temperature on intermittent duty stations) by the voltage divider made up of two resistors and a diode between the regulated supply voltage and the switched A- source. Since A+ is applied to the board continuously and A- is only applied when the transmitter is keyed by the push-to-talk

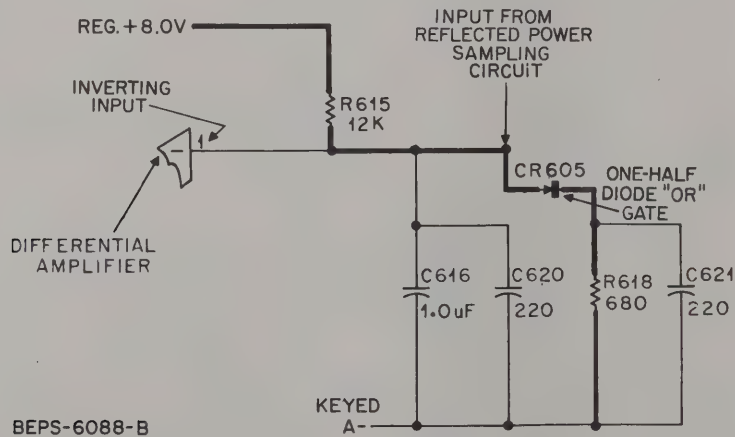


Figure 5.
Reference Power Bias Circuit

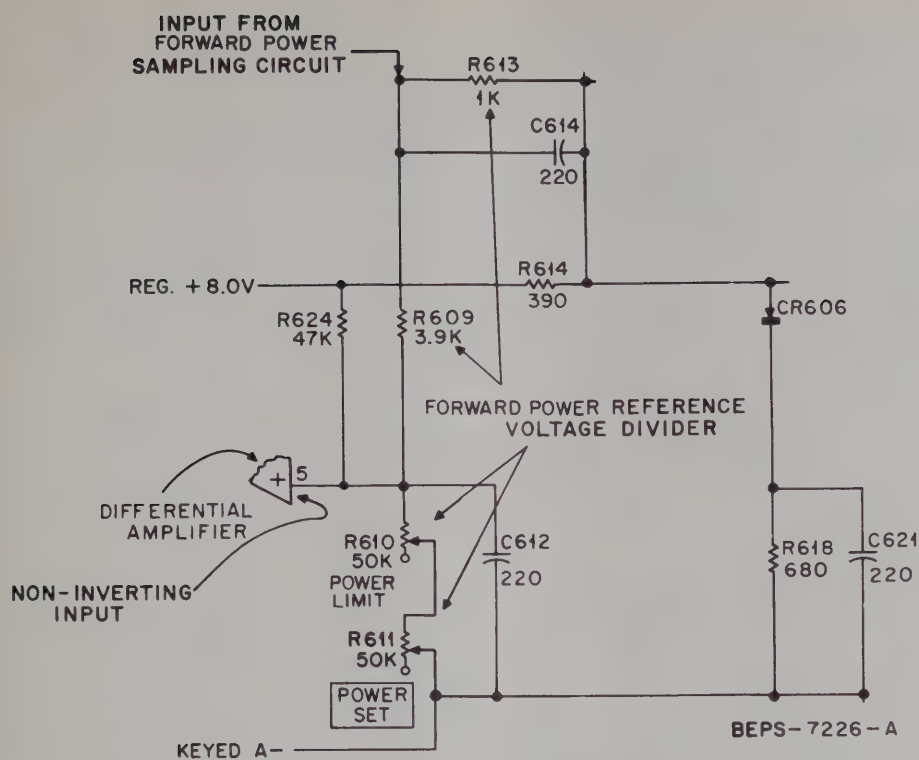


Figure 6.
Forward Power Bias Circuit

switch, the larger capacitor connected between the inverting input and keyed A- provides a time constant which allows the inverting input bias to build up slowly when power is first applied. This prevents full power output from occurring until the leveling circuitry can react and reach a quiescent level.

b. Directional Coupler

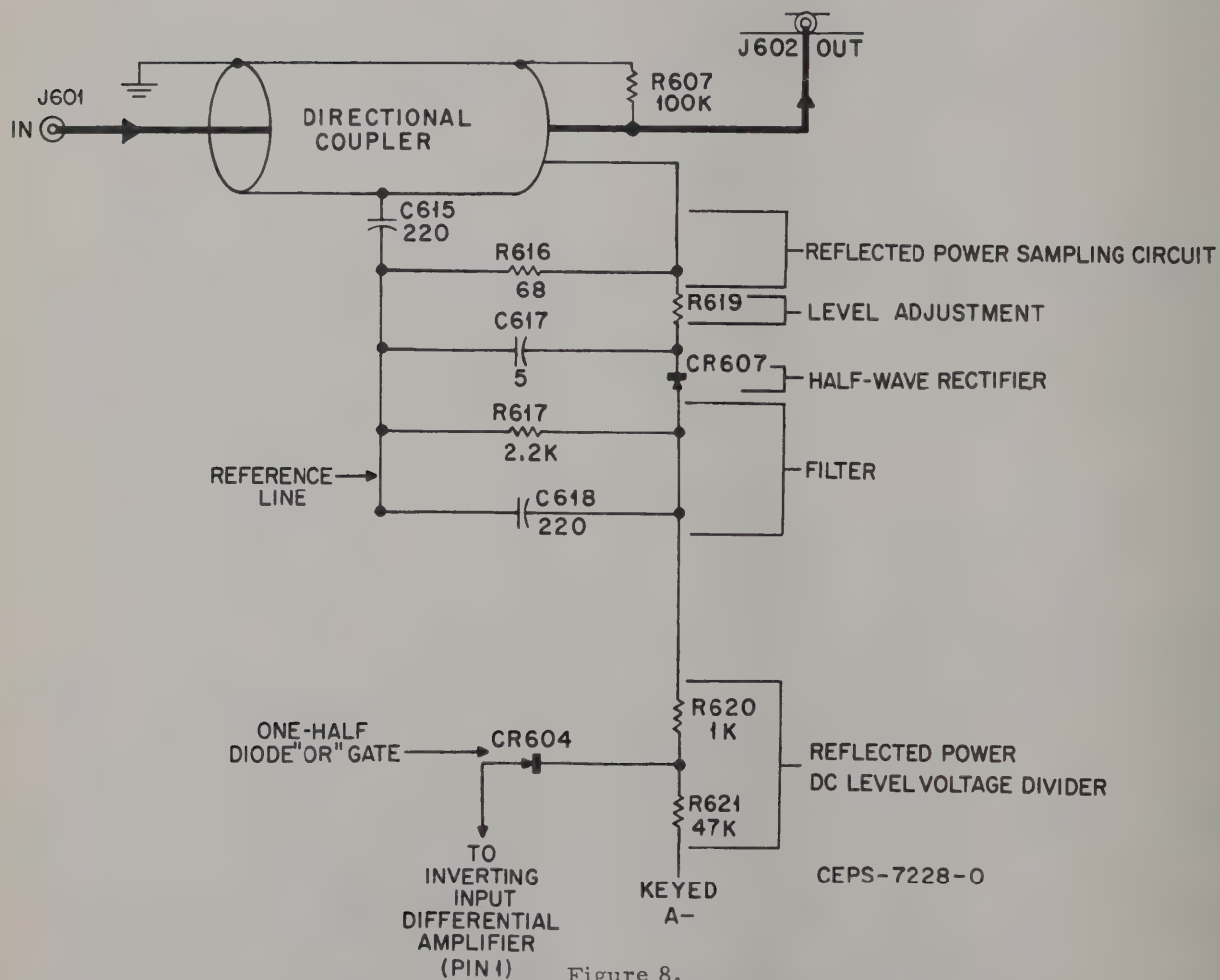
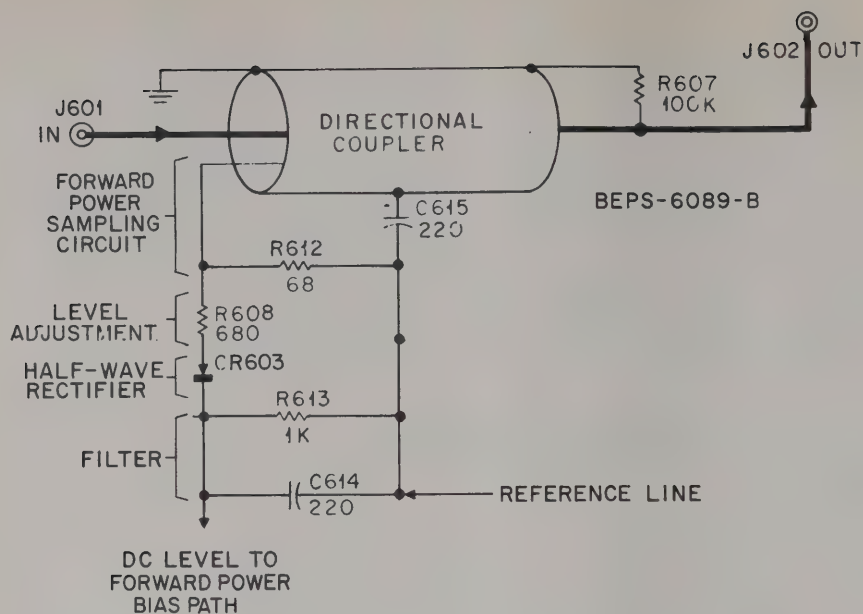
The directional coupler measures the voltage and the current traveling in both directions. The detection of forward (output) power causes a proportional voltage bias that is combined with the voltage-divider generated bias to set the potential on the non-inverting input of the differential amplifier. Any reverse power detected causes the VSWR circuitry to decrease the power output.

c. Protection Circuitry

(1) Forward Power Bias and Detection Circuit

Refer to Figure 6. The forward power reference voltage divider comprised of two resistors and two potentiometers provides a stable potential that supplies a dc bias to the non-inverting input of the differential amplifier. With an

approximately correct power output from the final stages of the power amplifier, a dc level proportional to that power is produced by the forward power detector circuit, which, in combination with the voltage developed by the voltage divider, produces a bias on the non-inverting input that can be adjusted by the POWER SET potentiometer. The POWER LIMIT control is pre-set to prevent over-dissipation if the POWER SET control should be set to maximum. (Refer to the CAUTION preceding maintenance information in this section.) The dc bias value will be determined by the power amplifier output and, with no reflected power (VSWR 1:1), balanced against the reference bias present on the inverting input of the differential amplifier. Once the bias has been set, and change in power output will change the bias on the non-inverting input causing the differential amplifier to compensate for the deviation. The forward power detector circuit (refer to Figure 7) detects rf power flowing through the directional coupler when the transmitter is keyed, and causes a small proportional current flow in the forward power sampling circuit. The diode converts the rf sample into a pulsating dc voltage and the dc filter removes the ripple. This is the dc voltage which is added to the dc bias already applied to the non-inverting



input of the differential amplifier from the secondary divider circuitry.

(2) VSWR - Reverse Power Detection Circuit

Since the power control board is now operating correctly with the proper amount of forward power and the correct biases, the detection of reflected power causes a decrease in the power amplifier's output in the following manner.

Refer to Figure 8. The components of the reverse power detector circuit function the same as those in the forward power detector. The voltage divider develops a bias voltage that isn't quite enough to forward bias the diode that makes up one-half of a diode "OR" gate. When reflected power is detected, the resultant negative-going dc level lowers the dc bias level and the combination of the two forward bias the diode. The negative-going dc level on the inverting input increases the output voltage of the differential amplifier, decreasing the dc control output to protect the final stages of the power amplifier.

(3) Temperature Protection Circuit

Refer to Figure 9. When the heat sink temperature rises above approximately 80°C, the thermistor in parallel with the lower half of the VSWR voltage divider reaches a value of resistance which allows a more negative potential to be applied through the diode "OR" gate to the inverting input of the differential amplifier. The temperature protection decreases the level of the reference and therefore the power output of the power amplifier board.

Thermistor RT601 is omitted on continuous duty stations. Temperature protection is not needed due to the large exchanger used.

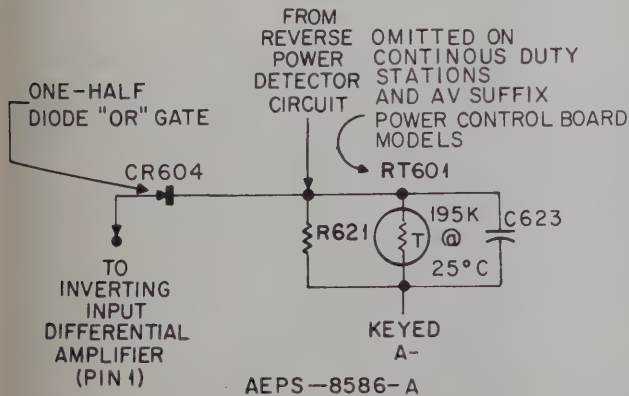


Figure 9.
Temperature Protection Circuit

(4) DC Level Output Amplification

The output of the differential amplifier is applied to the base of a voltage-inverting transistor amplifier whose output supplies the output control current. As the forward power increases above the normal value, the output of the differential amplifier increases proportionally. Since the dc level is increasing the base, the P-N-P transistor conducts less and the potentials across the output load resistor, and on the control output line, decrease.

4. MAINTENANCE

CAUTION

The power control board is incorporated in the transmitter to provide protection for the rf power transistors under environmental conditions such as voltage, temperature, load variation, and device variations. In order for the circuitry to operate properly and provide protection it is necessary to set the power output control (POWER SET) in accordance with the station alignment procedure.

a. General

Two basic maintenance approaches may be used for localizing and replacing trouble in these radio sets.

● Replace the defective circuit board with a spare and return the defective board to a maintenance shop for repair.

If necessary, a power control board from a "Micor" mobile radio may be used as a replacement. In continuous duty stations, remove thermistor RT601 before installing the board.

CAUTION

If the power control board is removed from a continuous duty station, be sure Thermistor RT601 is replaced before using the board in a mobile radio or intermittent duty station.

● Isolate and repair the trouble on the spot. This approach must be used if spares are not available.

Regardless of the maintenance approach used, a few simple tests on the overall radio set will localize the trouble to the power control board if it is defective. These procedures are given elsewhere in the manual. This section of the manual provides the maintenance shop level

procedures for the power control circuitry. It assumes that preliminary tests have already localized the trouble to the power control board. These bench test type procedures include measurements with a Motorola portable test set, a simple set of performance tests, and complete troubleshooting procedures including step-by-step circuit check-out.

NOTE

The power control board must be installed in the station for testing to provide the necessary power, ground, control, and signal connections. For bench testing of a board that has been removed from the station and replaced by a spare, another station or Motorola "Micor"® mobile FM two-way radio is required as a test fixture for troubleshooting.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the board. All such equipment is battery operated. When ac operated equipment is used, the ground lead must not be electrically connected to ac line ground.

(1) Optional built-in station metering or Motorola S1056B through S1059B Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. (The meter or portable test set is necessary to monitor forward and reverse power detectors.)

(2) Motorola Solid-State DC Multimeter or equivalent. A 20,000 ohm-per-volt multimeter may be used but a low impedance volt-ohm meter may not be used. This meter is used for measuring dc voltages and resistance.

(3) Motorola T1013A RF Load Resistor (Dummy Load) or equivalent.

c. Metering

The power control board is equipped with a metering receptacle which allows three major test points (forward power, reflected power and control current) to be measured. Refer to the troubleshooting charts or the schematic diagram for the correct meter indications.

When optional built-in station metering is used in continuous duty stations, only exciter output (PA input), final PA current, and final PA voltage may be checked. Refer to the alignment procedure for selector switch position functions.

(1) Using Built-In Station Metering

(a) The output of the power control board must be terminated in one of three types of loads.

--The antenna load

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback due to a defective antenna.

(b) Turn the station ON.

(c) Set the selector switch of the built-in station meter to position 1 and key the transmitter. Observe the wattmeter, or the meter reading if a dummy load is used or if the antenna is used. Unkey the transmitter. Under normal conditions at rated power out, meter 1 should read between 22 uA and 40 uA typically.

(2) Using Portable Test Set

(a) Set the function selector switch of the portable test set to the XMTR position.

(b) Set the meter reversing switch of the test set to the METER REV position.

(c) Set the REF switch to position A or B.

(d) Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

(e) Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control circuit board. Connect the white "metering" plug of the adapter cable to the receptacle on the power control board.

(f) The output of the power control board must be terminated in one of three types of loads.

--The antenna load.

--A dummy load such as Motorola's T1013A RF Load Resistor.

--An RF wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback due to a defective antenna.

(g) Turn the station ON.

(h) Set the selector switch of the test set to position 1 and key the transmitter with the XMTR ON button on the test set. Observe the wattmeter, or the meter reading if a dummy load is used or if the antenna is used. Unkey the transmitter. Under normal conditions at rated power out, meter 1 should read between 22 uA and 40 uA typically.

d. Performance Test, Power Set Control

This control allows the power output of the radio set to be varied from zero (0) power out with the control fully counterclockwise to greater than the rated output.

CAUTION

For proper operation of the protection circuitry, it is imperative that the POWER SET control never be left in a position that exceeds rated power output.

Refer to the power amplifier tune-up procedure.

(a) Key the transmitter.

(b) Adjust the POWER SET control until the rated power output is reached.

(c) Unkey the transmitter.

e. Troubleshooting

(1) Isolating Defective Components

If built-in station meter or test set readings are abnormal or tests indicate subnormal performance, a logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting charts summarize these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all circuits powered by A+ and A- are not referenced to chassis ground, but to A-. This feature allows operation from positive or negative ground power sources.

(2) Troubleshooting Integrated Circuits

Integrated circuits (IC's) are very reliable components and should not be replaced until all checks have proven definitely that the IC is the defective component. Removal of an IC is time consuming and often ruins the part. Therefore, a few extra checks before that task is attempted are worthwhile. Before replacing a bad IC, make sure that the external components in the circuit are normal. Otherwise, the conditions which caused the IC to fail initially may still be present and destroy the new IC.

A defective IC on the power control board may be located by dc voltage measurements. Measure the dc voltages at the pins of the IC, as shown in the troubleshooting charts. Refer to the troubleshooting charts or the IC601 Schematic Diagram (Figure 3.), to locate and isolate any defective component on the board.

If the IC is to be replaced, use a "desoldering" iron with a vacuum bulb to remove solder.

f. Troubleshooting Notes

The schematic diagram of the power control board contains the voltages necessary for troubleshooting. These voltages are typical for normal operating conditions at rated power out for the station. Refer to the troubleshooting charts and the schematic when troubleshooting and a defect is suspected on the power control board.

NOTES

- (1) Slight variations in meter readings or power out may occur during measurements. This is normal and does not necessarily indicate any problem.
- (2) With 0 reflected power (1:1 VSWR), meter 2 will read between -10 uA and -18 uA on Model TLD8610A, and between -3 uA and -8 uA on Model TLD8620A. Again, this is normal and does not indicate a defect. The meter reversing switch on the portable test set must be placed in the OFF position for upscale readings of meter 2. Built-in station metering polarity switch must be set to FWD when metering the power control board.

g. Complete Power Amplifier Alignment

A complete realignment of the power amplifier tuning controls and power control board adjustments may be necessary under the following conditions:

(1) Major changes, repairs (such as transistor replacement) or complete replacement of the power amplifier board.

(2) Repair or replacement of the power control board.

(3) A change in transmitter frequency greater than approximately ± 1 MHz.

A complete alignment procedure is at the end of this section.

IMPORTANT

The complete alignment procedure differs from the standard tune-up procedure in that a factory set control which has been adjusted for full power amplifier protection under tune-up conditions must be readjusted. This complete alignment procedure is not required and should not be performed when an alignment check is required or if frequency has been changed less than ± 1 MHz.

CONT'D)

ONT'D)

If the transmitter
the exciter board

C & METER
V SWITCH
POSITION
(SEE NOTE)

STAGE

METER
WITCH
ION
(NOTE)

STAGE AND PROCEDURE

STEP	ADJUST	METERING PLUG LOCATION	TRANSN REV. A	TRANSN REV. B	FINAL COLLECTOR VOLT- AGE - Measure the final collector voltage (V_C). V_C is the meter 6 reading (0-30 V scale).
1			Adjust F the stati output is ther inc is obser adjust th control 5- to 10	Determine the final input power (P_{in}). P_{in} equals $V_C \times I_C$. P_{in} should be less than: 120 W for 60 W models 180 W for 90 W models 200 W for 100 W and 110 W models	
2	C501 C502 R610		TER REV A	PA DRIV C501 for reading. minimum at maxim 90/100/ C501, th mum me	METERING
			TER REV A	Adjust F power o approx 110-wat ly 115 W NOTE: c cannot b steps 5	proper 50 ohm load.
			TER REV B	Replace board sh models) exceeds 0/ is repla and adju knob to the stati reading obtained placed. should b fied in s	FUNCTION
			TER REV A	TRANST Adjust t trol for repeat s	Indicates forward power out- put per calibration label on PA shield.
3	POWER SET	POWER CONTROL BOARD	TER REV B	FINAL CURRE ing plug the final (I_C). I_C meter 5 for 60- reading 90/100/	A meter reading higher than the normal range indicates reflected power caused by a defective antenna, antenna switch, or cables.
4	C501	POWER CONTROL BOARD			Indicates the relative level of drive sent to the PA on the blue control lead. A reading of greater than 35 uA indicates the power control board is set for a higher power than the radio is capable of supplying.

Complete Power Amplifier
Alignment Procedure
Motorola No. PEPS-8312-D
6/20/80-PHI

g. Complete Power Amplifier Alignment

A complete realignment of the power amplifier tuning controls and power control board, adjustments may be necessary under the following conditions:

(1) Major changes, repairs (such as transistor replacement) or complete replacement of the power amplifier board.

(2) Repair or replacement of the power control board.

(3) A change in transmitter frequency greater than approximately ± 1 MHz.

A complete alignment procedure is at the end of this section.

IMPORTANT

The complete alignment procedure differs from the standard tune-up procedure in that a factory set control which has been adjusted for full power amplifier protection under tune-up conditions must be readjusted. This complete alignment procedure is not required and should not be performed when an alignment check is required or if frequency has been changed less than ± 1 MHz.

COMPLETE POWER AMPLIFIER
ALIGNMENT PROCEDURE

NOTE
If the transmitter frequency is to be changed, first realign
the exciter board per the exciter alignment procedure.

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	OSC & METER REV. SWITCH POSITION (SEE NOTE)	STAGE AND PROCEDURE
1					If the power amplifier is to be re-aligned greater than ±1 MHz from the original frequency, proceed with step 2. If the power amplifier is to be re-aligned less than ±1 MHz from the original frequency, remove the power control board shield, move the metering plug to the power control board and proceed to step 6.
2	C501 C502 R610				PRE-ALIGNMENT - Set capacitor C501 fully clockwise. For 90-, 100-, and 110-watt radio sets, also set capacitor C502 to maximum capacity (plates fully meshed). Remove the power control board shield and move the metering plug to the power control board. Use tuning tool #66A82846D01, or equivalent, to pre-align R610 located on the component side of the board. Access to this control is provided by a small slot located approximately 3/4-inch from the POWER SET access hole. The tuning tool is used to rotate the outer edge of a serrated knob. Adjust the POWER LIMIT control to the end of its travel by rotating the edge of the knob toward the bottom of the station.
3	POWER SET	POWER CONTROL BOARD			TRANSMITTER OUTPUT - Adjust the POWER SET control to the maximum clockwise position.
4	C501	POWER CONTROL BOARD	5	METER REV REF B	PA DRIVER OUTPUT - Observe meter 5. If this indication is LESS than 50 uA (full scale), proceed with step 5. If this indication is GREATER than 50 uA, tune C501 for an on-scale reading.

ALIGNMENT PROCEDURE (CONT'D)

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	OSC & METER REV SWITCH POSITION (SEE NOTE)	STAGE AND PROCEDURE
5	R610	POWER CONTROL BOARD	Wattmeter or 1	METER REV REF A	TRANSMITTER OUTPUT - Adjust R610 toward the top of the station until either rated output is attained or no further increase in power output is observed. In either case, adjust the POWER LIMIT control for an approximate 5- to 10-watt reduction.
6	C501 C502	POWER CONTROL BOARD	5	METER REV REF B	PA DRIVER OUTPUT - Tune C501 for a minimum meter 5 reading. If a dip is not present, minimum meter 5 should occur at maximum capacitance. On 90/100/110-watt models tune C501, then C502 for a minimum meter 5 reading.
7	R610	POWER CONTROL BOARD	Wattmeter or 1	METER REV REF A	TRANSMITTER OUTPUT - Adjust R610 for the following power output: 60-watt models approximately 65 W, 90/100/110-watt models approximately 115 W. Repeat step 6. NOTE: If the required output cannot be obtained, repeat steps 5 and 6.
8	R610	POWER CONTROL BOARD	5	METER REV REF B	Replace the power control board shield. If meter 5 exceeds 50 uA when the shield is replaced, remove the shield and adjust R610 slightly (turn knob toward the bottom of the station) until an on-scale reading--50 uA or less--is obtained with the shield replaced. The power output should be at least that specified in step 7.
9	POWER SET	POWER CONTROL BOARD	Wattmeter or 1	METER REV REF A	TRANSMITTER OUTPUT - Adjust the POWER SET control for rated power out and repeat step 6.
10		PA	5	METER REV REF B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (I_c). I_c , in amperes, is the meter 5 reading, (0-50) x 1/5 for 60-watt models; meter 5 reading (0-50) x 1/2 for 90/100/110-watt models.

ALIGNMENT PROCEDURE (CONT'D)

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	OSC & METER REV SWITCH POSITION (SEE NOTE)	STAGE AND PROCEDURE
11		PA	6	METER REV. REF B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (V_c). V_c is the meter 6 reading (0-30 V scale).
12					Determine the final input power (P_{in}). P_{in} equals $V_c \times I_c$. P_{in} should be less than: 120 W for 60 W models 180 W for 90 W models 200 W for 100 W and 110 W models

POWER CONTROL BOARD METERING

NOTE
Radio operating at rated power into proper 50 ohm load.

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION (SEE NOTE)	NORMAL METER READINGS	FUNCTION
1	A (Meter Reverse On)	22-45 uA	Indicates forward power output per calibration label on PA shield.
2	A	3-8 uA (60 W models) 10-18 uA (90/100/ 110 W models)	A meter reading higher than the normal range indicates reflected power caused by a defective antenna, antenna switch, or cables.
5	B (Meter Reverse On)	3-35 uA	Indicates the relative level of drive sent to the PA on the blue control lead. A reading of greater than 35 uA indicates the power control board is set for a higher power than the radio is capable of supplying.

METERING NOTE

Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage. The optional built-in station metering is similar to the portable test set except PA voltage is measured with the two voltage probes. The built-in metering polarity switch is set to REV for PA metering and FWD for Power Control Board metering.

START

FULL POWER OUT
(NO CONTROL WITH
POWER SET CONTROL
FULLY CCW)

DE-KEY THE
CHECK FOR BAD
NNA CABLE.
ED POWER MUST
D BEFORE PRO-

TOO HIGH

CHECK METER 2 ON
POWER CONTROL BOARD
SHOULD BE LESS THAN
25 μ A

OK

CHECK METER 5
ON POWER CONTROL
BOARD

LESS THAN
35 μ A

SHORTED CONTROL STAGE
(ON P.A.) OR A- SHORTED
TO COLLECTOR OF Q501
ON PA DECK

VOLTAGE
FOR CIRCUITRY
STAGE DIVIDER
PROPER
CS. SEE FIG. 3

BAD (TOO
HIGH OR
TOO LOW)

CHECK PIN 6 (OR 7) OF
IC601
APPROXIMATELY 8 V

POWER
OUTPUT
STILL FULL

SLOWLY TURN POWER
SET CONTROL FULLY
CCW

POWER
DROPS
GRADUALLY

POWER
SET WAS
IMPROPERLY
ADJUSTED

GOOD

OK

POWER DROPS
SHARPLY

PIN 1 OF
APPROXIMATELY 5.2 V

GOOD

PIN 5 OF IC601

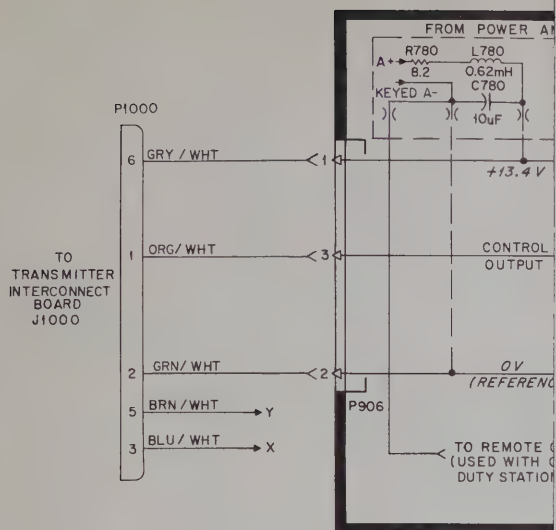
TOO HIGH

POT OPEN (POT
MUST NOT BE FULLY
CCW). IC601 DEFECTIVE
CHECK METER 1 (APPROX-
IMATELY 30 μ A FOR RATED
POWER)

APPROXIMATELY
EQUAL TO
PIN 1

IC601 BAD
IC601 BAD
IC601 BAD

EEPS-8342-Q



POWER CONTROL BOARD

601. VOLTAGES AT PINS 1 AND 5 SHOULD DIFFER BY LESS THAN 50 mV.
602. VOLTAGES MEASURED AT 25 C.
- 603.

POWER	R606	R622	R617
60 W	15K	18K	1.8K
90/100/110 W	27K	47K	2.2K

604. TYPICAL VOLTAGES UNDER NORMAL OPERATING CONDITIONS.
605. UNLESS OTHERWISE STATED; CAPACITOR VALUES ARE IN PICO FARADS.
606. FACTORY ADJUSTMENT.
607. RT601 OMITTED IN CONTINUOUS DUTY STATIONS AND FOR MODELS TLD8610AV & TLD8620AV.
608. USED ONLY IN CONTINUOUS DUTY STATIONS. NOT PART OF OR MOUNTED ON POWER CONTROL BOARD. PART OF MODEL TLN4780A P.A. HEAT SINK KIT.
609. ON MODEL TLD5960A CR602 IS A HYBRID ASSEMBLY.

EPS-8313-E

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

TLD8610A-1 and TLD8620A-1

TLD8610AV and TLD8620AV

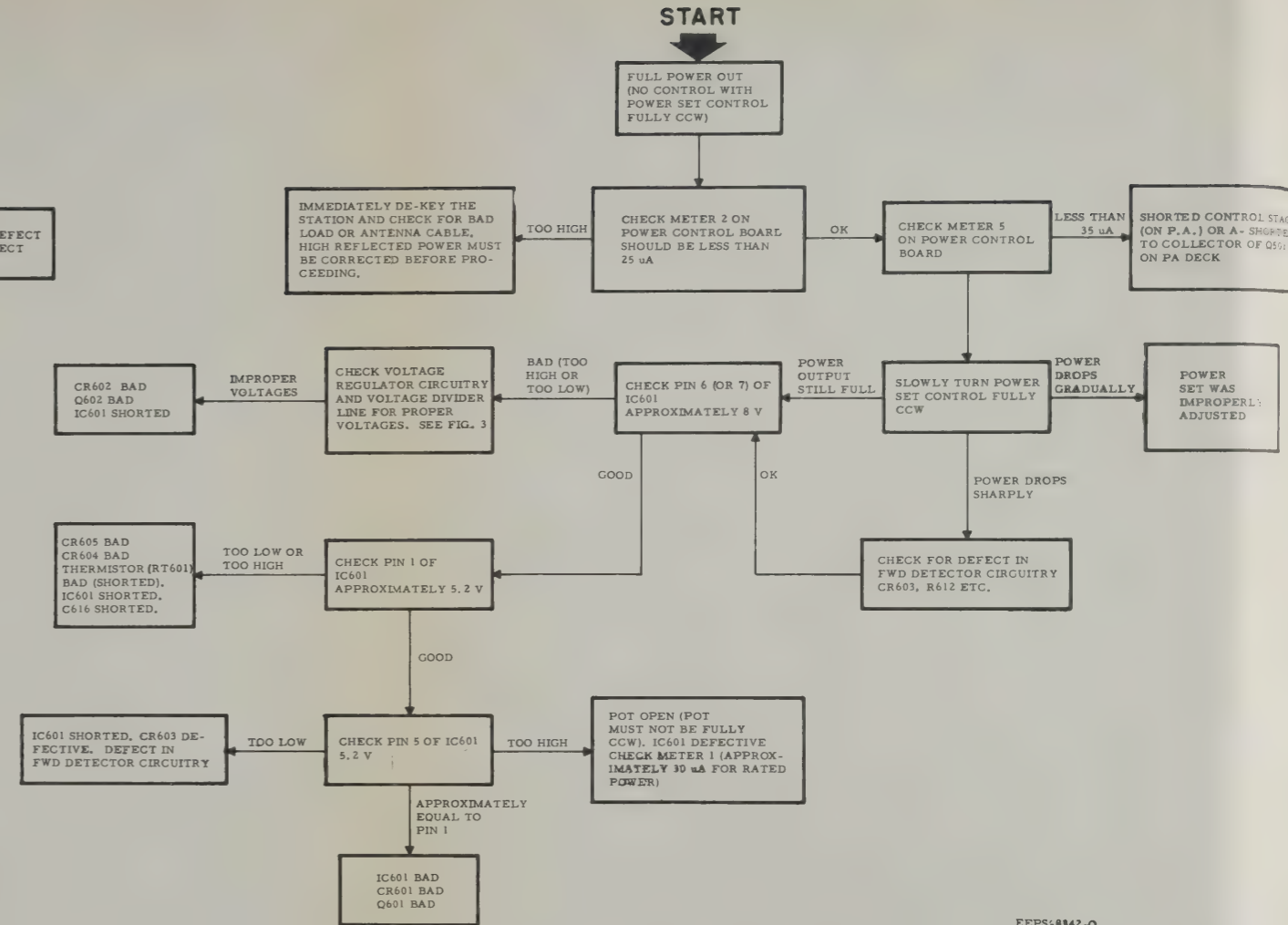
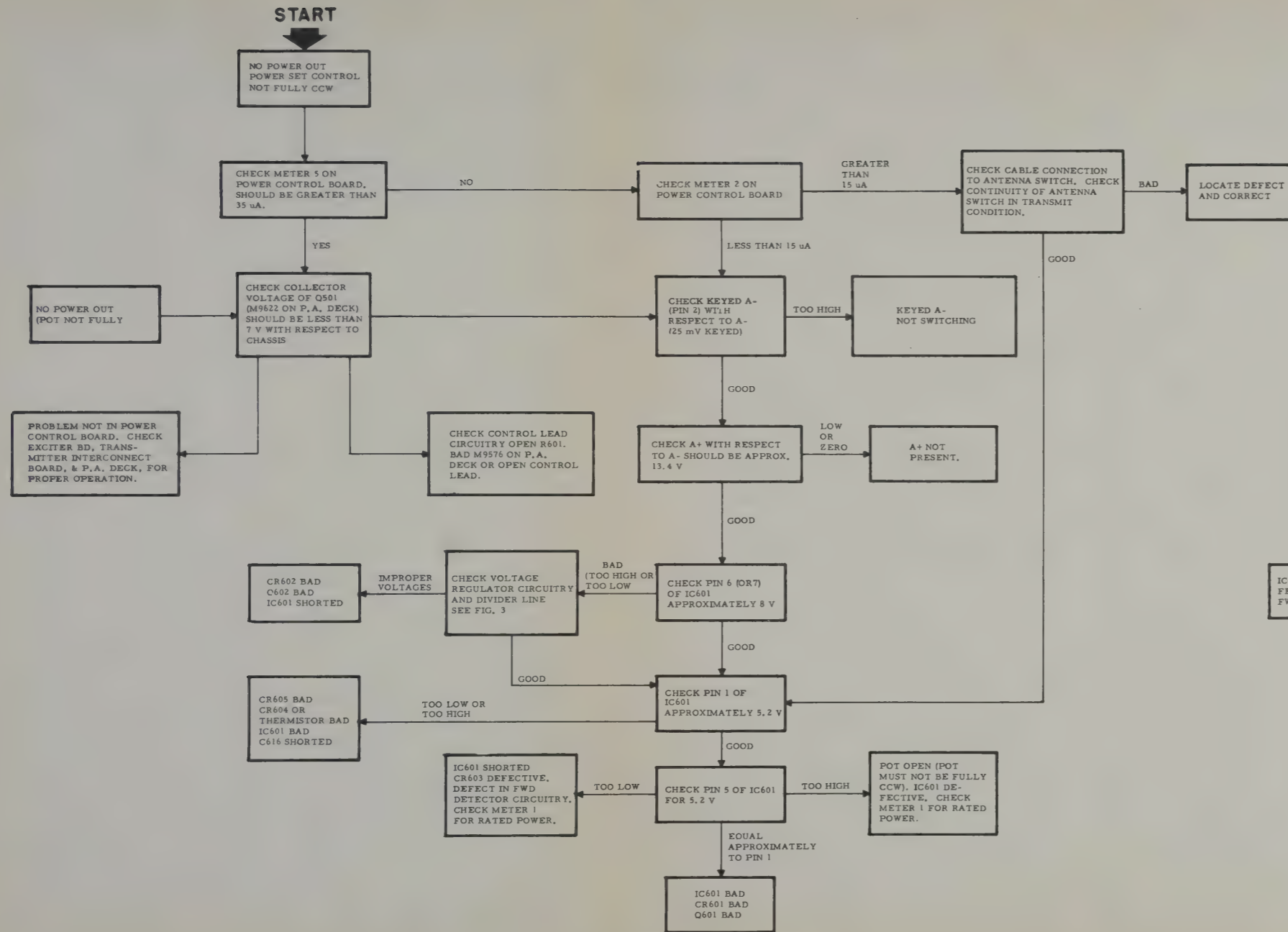
Power Control Board

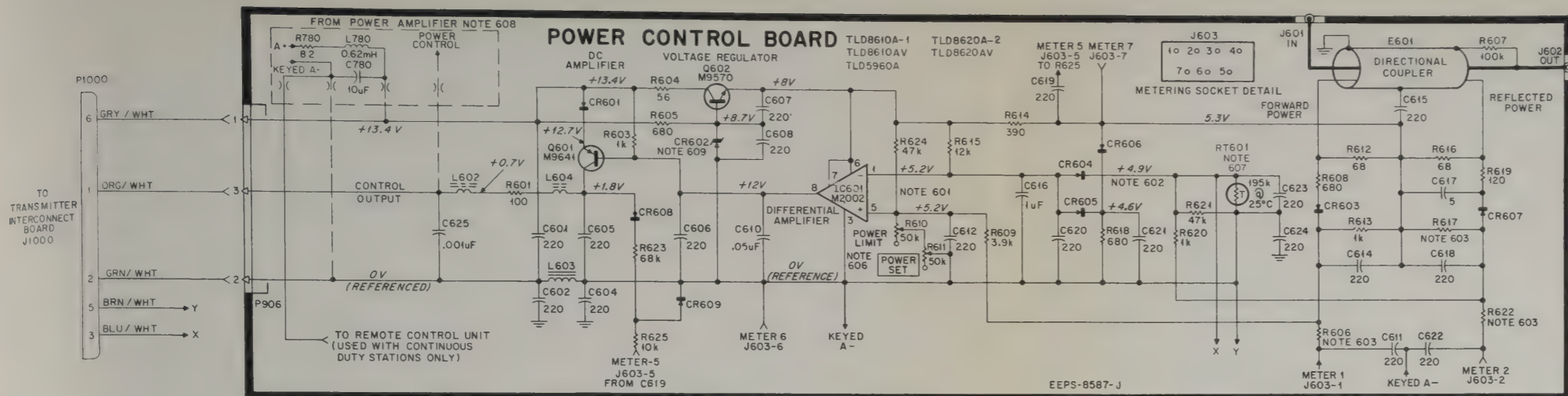
Schematic Diagram & Circuit Board Detail

Motorola No. 63P81015E08-K

6/20/80-PHI

POWER CONTROL BOARD





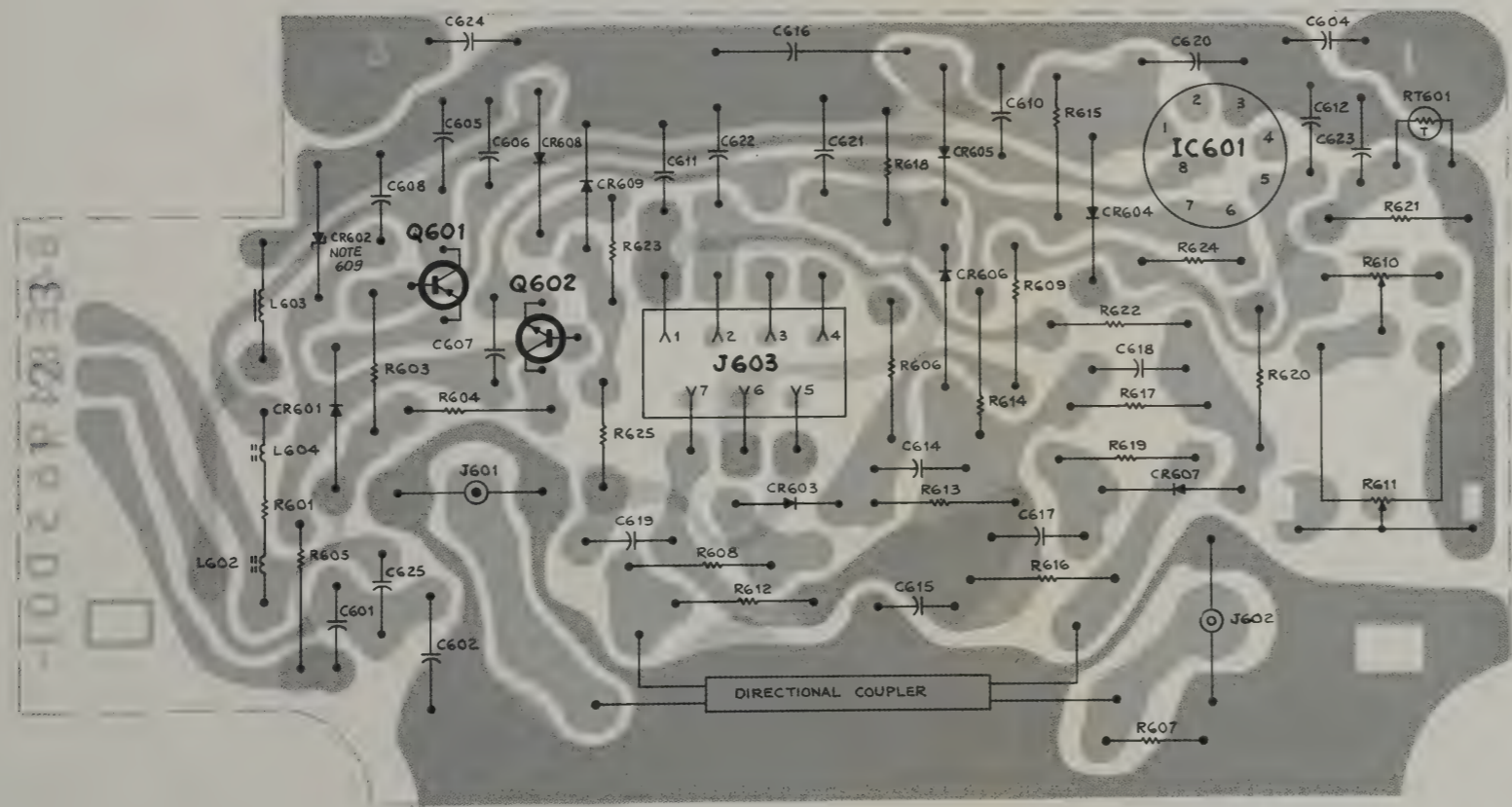
POWER CONTROL BOARD

601. VOLTAGES AT PINS 1 AND 5 SHOULD DIFFER BY LESS THAN 50 mV.
602. VOLTAGES MEASURED AT 25 C.
603.

POWER	R604	R622	R617
0 W	15K	18K	1.8K
90/100/110 W	27K	47K	2.2K

604. TYPICAL VOLTAGES UNDER NORMAL OPERATING CONDITIONS.
605. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICO FARADS.
606. FACTORY ADJUSTMENT.
607. RT601 OMITTED IN CONTINUOUS DUTY STATIONS AND FOR MODELS TLD8610AV & TLD8620AV.
608. USED ONLY IN CONTINUOUS DUTY STATIONS. NOT PART OF OR MOUNTED ON POWER CONTROL BOARD. PART OF MODEL TLN4780A P.A. HEAT SINK KIT.
609. ON MODEL TLD5960A CR602 IS A HYBRID ASSEMBLY.

EPS-8313-E



PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
TLD8610A-1 and TLD8620A-1
TLD8610AV and TLD8620AV
Power Control Board
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81015E08-K
6/20/80-PHI

PARTS LIST

Control Board (High Power)
 Control Board (Low Power)
 Control Board (High Power) PL-1508-F

NOTE

ers more than one model. Where differences
 nber of the applicable unit is given in the
 1.

-83596E10	<u>CAPACITOR, fixed:</u> 220 pF $\pm 20\%$; 500 V
-83596E10	220 pF $\pm 20\%$; 500 V
-83596E10	220 pF $\pm 20\%$; 500 V
-82372C04	.05 uF $\pm 80-20\%$; 25 V
-83596E10	220 pF $\pm 20\%$; 500 V
-83596E10	220 pF $\pm 20\%$; 500 V
-83214C04	1.0 uF $\pm 20\%$; 15 V
-82133G53	5 pF ± 0.5 pF; 500 V; NP0
-83596E10	220 pF $\pm 20\%$; 500 V
-82187E14	.001 uF $\pm 10\%$; 100 V
-83654H01	<u>SEMICONDUCTOR DEVICE,</u> <u>diode:</u> silicon
-83696E04	Zener (9.1 V)
-80709D68	hybrid assembly
-84616A01	<u>silicon</u>
-82392B18	silicon
-82392B18	silicon
-82392B18	silicon
-84616A01	silicon
-82392B03	silicon
-82392B18	silicon
-84685B01	<u>COUPLER, line:</u> dual
-84320A02	<u>INTEGRATED CIRCUIT:</u> M2002
-84227B02	<u>CONNECTOR, receptacle:</u> male; single contact
-84231B02	female; single contact
-84207B01	female; 7 contact
-83960B01	<u>COIL, RF:</u> ferrite bead
-83961B01	choke
-83960B01	ferrite bead
-	<u>CONNECTOR, plug:</u> consists of: (TLD8610AV & TLD8620AV only)
-83498F06	HOUSING, connector
-83499F01	CONTACT, terminal: 5 used
-84549F01	PLUG, polarizing
-869641	<u>TRANSISTOR:</u> PNP; type M9641
-869570	NPN; type M9570
-82291B21	<u>RESISTOR, fixed: $\pm 10\%$; 1/4 W:</u> unless otherwise stated
-124C49	1k
-124C19	56
-124A45	680 $\pm 5\%$
-124A77	15k $\pm 5\%$ (TLD8610A only)
-6-124A83	27k $\pm 5\%$ (TLD8620A, TLD5960A)
-124C97	100k
-124A45	680 $\pm 5\%$
-124A63	3.9k $\pm 5\%$
-83083G26	variable; 50k
-83083G20	variable; 50k
-124A21	68 $\pm 5\%$
-124A49	1k $\pm 5\%$
-124A39	390 $\pm 5\%$
-124C75	12k
-124A21	68 $\pm 5\%$
-124A57	2.2k $\pm 5\%$ (TLD8620A, TLD5960A)
-6-124A55	1.8k $\pm 5\%$ (TLD8610A only)
-124A45	680 $\pm 5\%$
-124A27	120 $\pm 5\%$
-124C49	1k
-124A89	47k
-131526	18k $\pm 5\%$ (TLD8610A only)
-6-124A89	47k $\pm 5\%$ (TLD8620A, TLD5960A)
-185A93	68k $\pm 5\%$; 1/8 W
-185B99	47k; 1/8 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R625	6-185A73	10k $\pm 5\%$; 1/8 W
RT601	6-82462G03	<u>THERMISTOR:</u> 195k $\pm 25^\circ\text{C}$ (TLD8610A & TLD8620A only)
MECHANICAL PARTS		
	3-139506	SCREW, tapping 4-40 x 5/16"; 4 used
	42-84284B01	RETAINER; 4 used
	55-84300B04	HANDLE

Power Amplifier Heatsink Kit (P/O TLN4780A) PL-2657-A

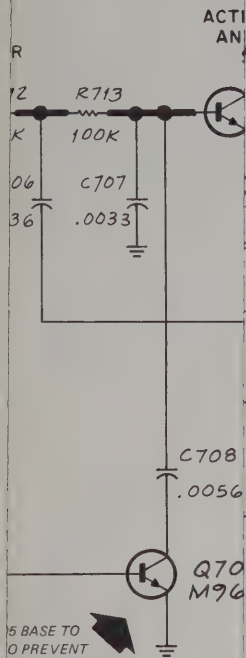
C780	23-83214C20	<u>CAPACITOR, fixed:</u> 10 uF $\pm 20\%$; 20 V
L780	24-80900A61	<u>COIL, RF: choke;</u> 0.62 mH; coded BRN-ORG
R780	6-124B67	<u>RESISTOR, fixed:</u> 8.2 $\pm 5\%$; 1/4 W

SIMPLEX "DIGITAL PRIVATE-LINE" ENCODER

MODEL TTN6003A

Q703 & Q704
HIGH GAIN
INPUT IM

Simplex "Digital Private-Line" Binary-Coded Squelch.



CHARGES RAPIDLY
DUE CR702 AND
BASE-EMITTER
Q706 TURNS ON.
Q706 TURNS OFF
DISCHARGES
DUE Q708, R720
R719. THIS REVERSE
ES CR702 TO TURN
Q707. DISCHARGE
ON CONTINUES FOR
MILLISECONDS AT
WHICH TIME Q707 TURNS
TO TURN OFF Q708.

generator (located on "Digital Private-Line" Decoder Board) to the exciter, filter for 23-bit binary code word.
A+ (180 millisecond transmitter turn-off delay.

"DIGITAL PRIVATE-LINE" ENCODER BOARD TROUBLESHOOTING CHART

PROBABLE CAUSES	ACTION
1. No keyed A+ to encoder board (pin 2).	Check keyed A+ at pin 10 of P902 on exciter board
2. Malfunction in delayed keyed A+ generation circuitry.	Check delayed turn-off switch, delay generator and keying switch operation on encoder board.
Malfunction in delayed keyed A+ circuits.	Check C710. Then check delay generator circuit.
1. No input to encoder board pin 6 from decoder board.	On decoder board, check U801-5 for code signal. Check for 6.0 V dc at U801-24. If 6.0 V dc is present, check 50 kHz clock for proper operation (U801-4). If clock is ok, replace U801.
2. Faulty inverter (Q702)	Check inverter operation.
3. Active filter malfunction	Check Q703, Q704 operation.
U801 code generator on decoder board is not switching.	On decoder board, ground U801-9. If code is still present at U801-5, check 50 kHz clock output (U801-4). If clock is ok, replace U801.
U801 code generator on decoder board is not switching.	Apply +9.6 V at J805 on decoder board. If turn-off code is still present at U801-5, replace U801.
1. Code deviation is greater than ± 1 kHz	Check for proper waveform amplitude at encoder board pin 10 (Xmit code out).
2. Low pass active filter is not switching from 140 Hz to 85 Hz.	Replace Q705.
1. No turn-off code is being transmitted.	Check the delayed keyed A+ duration (170-250 msec). Then check U801-5 on decoder board for presence of the turn-off code.
2. Low pass active filter is always switched low (85 Hz).	Replace Q705.
Wrong code is being transmitted.	Feed U801-5 from decoder board into a Motorola Model SLN6413A "Digital Private-Line" test set. Check for proper decode. If proper decode is not obtained. Check for an intermittent or bad code plug (TRN6005A) or resistor network (Z801) on the decoder board. Check U801-15 thru U801-23 for a proper octal code.

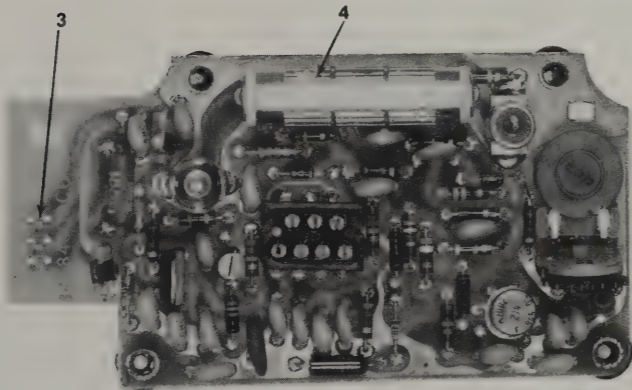
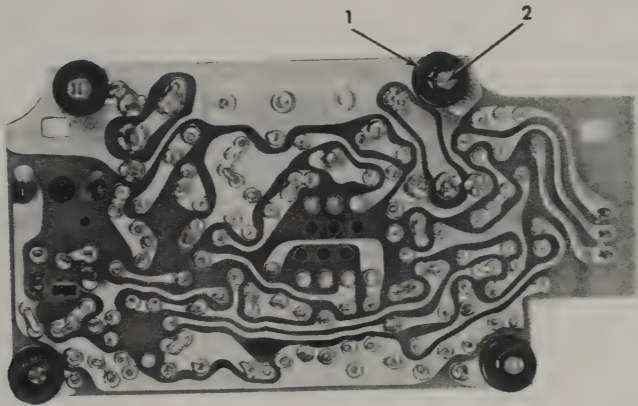
SIMPLEX "DIGITAL PRIVATE-LINE" ENCODER/DUPLEX "DIGITAL PRIVATE-LINE" ENCODER

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4780A-1	C780	ADDED 23-83214C20, 10 uF	P. A. INPUT (A+, A-)
	L780	ADDED 24-80900A61, 0.62 MH	
	R780	ADDED 6-124B67, 8.2 OHMS	
TLD8610A-1 TLD8620A-1	R619	FROM 6-124A13, 33 TO 6-124A27, 120	PARTS LIST
	R606	FROM 6-129887, 12K TO 6-124A77, 15K (TLD8610A ONLY)	
	R617	FROM 6-128689, 2.2K TO 6-124A55, 1.8K (TLD8610A ONLY)	
	RT601	FROM 6-867628 TO 6-82462G03 CIRCUIT BOARD PLATING REVISED	
TLD8610AV TLD8620AV		NEW MODELS ADDED	
TLD5960A		ADD NEW MODEL	

MECHANICAL PARTS LIST

PL-854-D

CODE	MOTOROLA PART NO.	DESCRIPTION
1 2	42C84284B01 3-139506	RETAINER; 4 used SCREW, tapping; 4-40 x 5/16"
3 4	29C84028H01 42B84678B01	TERMINAL, male; 3 used CLIP, component
NON-CODED ITEM		
	55B84300B04 1-80797B34	HANDLE, plastic CABLE ASSEMBLY (TLD8610AV & TLD8620AV only) includes: STRAP, tie
	42-10217A02	



BEPS-6542-O

ELECTRICAL PARTS LIST

TLD5960A Power Control Board (High Power)
TLD8610A/AV Power Control Board (Low Power)
TLD8620A/AV Power Control Board (High Power) PL-1508-F

NOTE This parts list covers more than one model. Where differences exist the model number of the applicable unit is given in the Description column.		
C601 C602 C604 thru 608 C610 C611, 612 C614, 615 C616 C617 C618 thru 624 C625	21-83596E10 21-83596E10 21-83596E10 21-82372C04 21-83596E10 21-83596E10 23-83214C04 21-82133G53 21-83596E10 21-82187E14	<u>CAPACITOR, fixed:</u> 220 pF ±20%; 500 V 220 pF ±20%; 500 V 220 pF ±20%; 500 V .05 uF +80-20%; 25 V 220 pF ±20%; 500 V 220 pF ±20%; 500 V 1.0 uF ±20%; 15 V 5 pF ±0.5 pF; 500 V; NP0 220 pF ±20%; 500 V .001 uF ±10%; 100 V
CR601 CR602 CR603 CR604 CR605 CR606 CR607 CR608 CR609	48-83654H01 48-83696E04 or 1-80709D68 48-84616A01 48-82392B18 48-82392B18 48-82392B18 48-84616A01 48-82392B03 48-82392B18	<u>SEMICONDUCTOR DEVICE,</u> <u>diode:</u> silicon Zener (9.1 V) hybrid assembly silicon silicon silicon silicon silicon silicon silicon <u>COUPLER, line:</u> dual
E601	58-84685B01	
IC601	51-84320A02	<u>INTEGRATED CIRCUIT:</u> M2002
J601 J602 J603	28-84227B02 9-84231B02 9-84207B01	<u>CONNECTOR, receptacle:</u> male; single contact female; single contact female; 7 contact
L602 L603 L604	76-83960B01 24-83961B01 76-83960B01	<u>COIL, RF:</u> ferrite bead choke ferrite bead
P1000	— 15-83498F06 29-83499F01 46-84549F01	<u>CONNECTOR, plug:</u> consists of: (TLD8610AV & TLD8620AV only) HOUSING, connector CONTACT, terminal: 5 used PLUG, polarizing
Q601 Q602	48-869641 48-869570	<u>TRANSISTOR:</u> PNP; type M9641 NPN; type M9570
R601 R603 R604 R605 R606	17-82291B21 6-124C49 6-124C19 6-124A45 6-124A77 or 6-124A83 6-124C97 6-124A45 6-124A63 18-83083G26 18-83083G20 6-124A21 6-124A49 6-124A39 6-124C75 6-124A21 6-124A57 or 6-124A55 6-124A45 6-124A27 6-124C49 6-124A89 6-131526 or 6-124A89	<u>RESISTOR, fixed; ±10%; 1/4 W:</u> unless otherwise stated 100 ±5%; 3 W 1k 56 680 ±5% 15k ±5% (TLD8610A only) 27k ±5% (TLD8620A, TLD5960A) 100k 680 ±5% 3.9k ±5% variable; 50k variable; 50k 68 ±5% 1k ±5% 390 ±5% 12k 68 ±5% 2.2k ±5% (TLD8620A, TLD5960A) 1.8k ±5% (TLD8610A only) 680 ±5% 120 ±5% 1k 47k 18k ±5% (TLD8610A only) 47k ±5% (TLD8620A, TLD5960A)
R618 R619 R620 R621 R622	6-185A93 6-185B99	68k ±5%; 1/8 W 47k; 1/8 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R625	6-185A73	10k ±5%; 1/8 W
RT601	6-82462G03	<u>THERMISTOR:</u> 195k @25°C (TLD8610A & TLD8620A only)
MECHANICAL, PARTS		
	3-139506 42-84284B01 55-84300B04	SCREW, tapping 4-40 x 5/16"; 4 used RETAINER; 4 used HANDLE

Power Amplifier Heatsink Kit (P/O TLN4780A) PL-2657-A

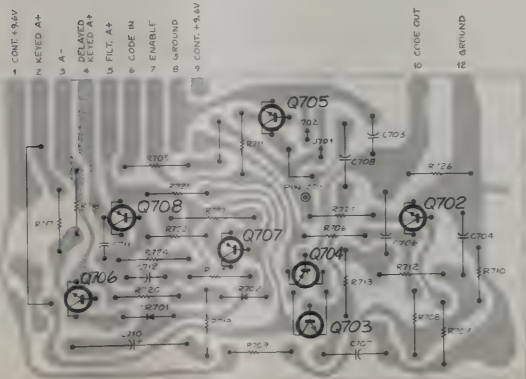
C780	23-83214C20	<u>CAPACITOR, fixed:</u> 10 uF ±20%; 20 V
L780	24-80900A61	<u>COIL, RF; choke:</u> 0.62 mH; coded BRN-ORG
R780	6-124B67	<u>RESISTOR, fixed:</u> 8.2 ±5%; 1/4 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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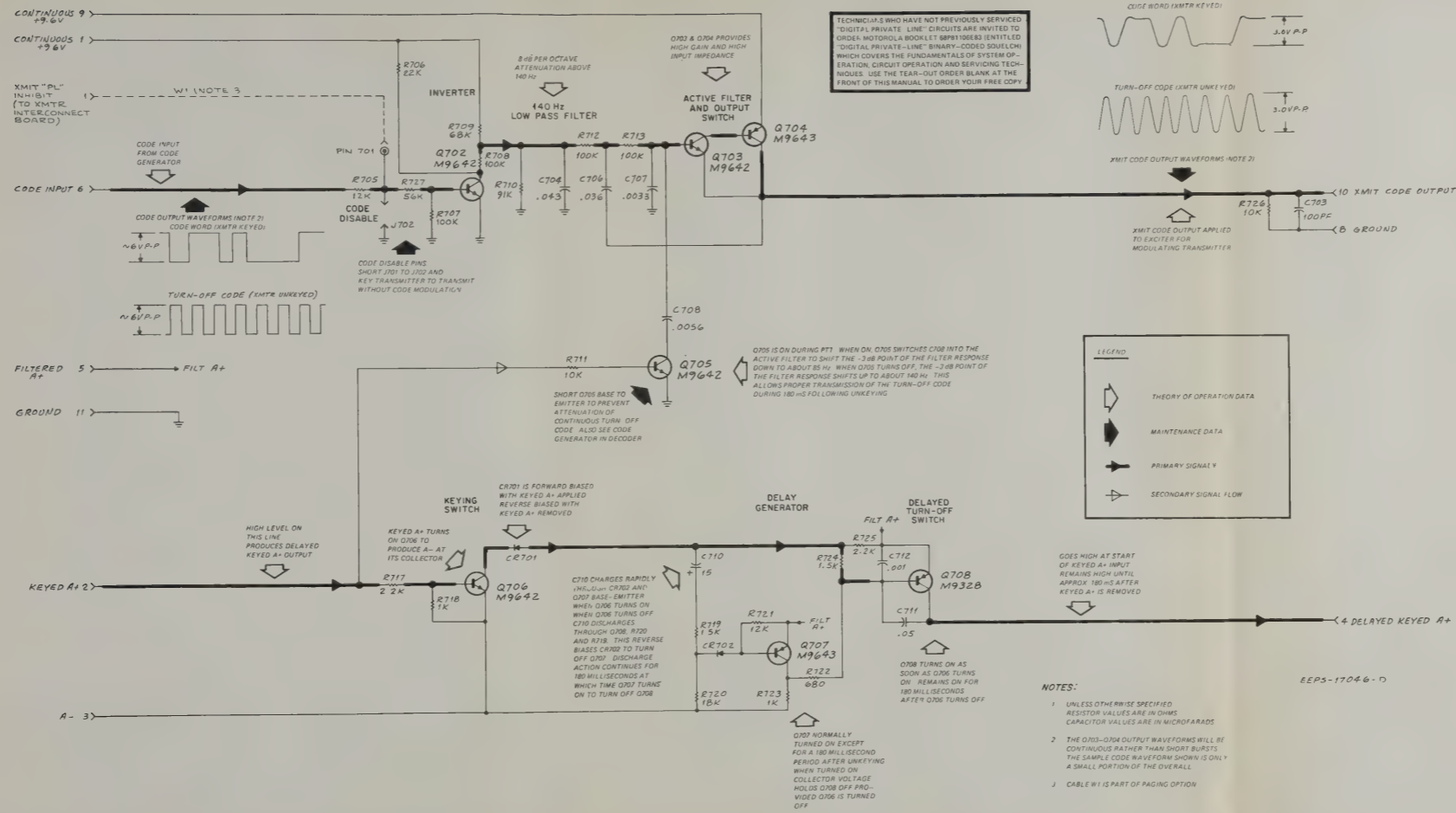
PARTS LIST TTN003A Encoder Board PL-3208-B

		CAPACITOR, fixed; uF:
CR04	21-831125	100 pF ±10%; 300 V
CR04	8-83813H14	.043 pF ±5%; 50 V
CR04	8-83813H24	.036 ±5%; 50 V
CR04	8-83813H27	.0033 ±5%; 50 V
CR04	8-83813H26	.0056
CR10	23-82783B24	15 ±10%; 25 V
CR11	21-82372C04	.05 ±80-20%; 25 V
CR12	21-83596E13	.001 ±10%; 100 V
CR701, 702		DIODE: (SEE NOTE) silicon
		TRANSISTOR: (SEE NOTE)
Q702, 703	48-869642	NPN: type M9642
Q705, 706	48-869643	PNP: type M9643
Q707	48-869642	NPN: type M9642
Q708	48-869328	PNP: type M9328
		RESISTOR, fixed; ±5%; 1/4 W: unless otherwise stated
R705	6-124A75	12k
R706	6-124A81	22k
R707, 708	6-124A97	100k
R709	6-124A93	68k
R710	6-124A96	91k
R711	6-124A73	10k
R712, 713	6-124A97	100k
R717	6-124C57	2.2k ±10%
R718	6-124A49	1k
R719	6-124A53	1.5k
R720	6-124A79	18k
R721	6-124A75	12k
R722	6-124A45	680
R723	6-124A49	1k
R724	6-124A53	1.5k
R725	6-124C57	2.2k ±10%
R726	6-124A73	10k
R727	6-124A91	56k
MECHANICAL PART		
3-139506	SCREW, tapping; 4-40 x 5/16"; 2 used	

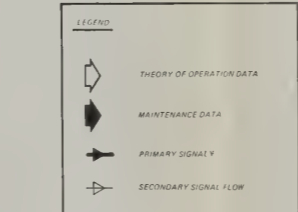
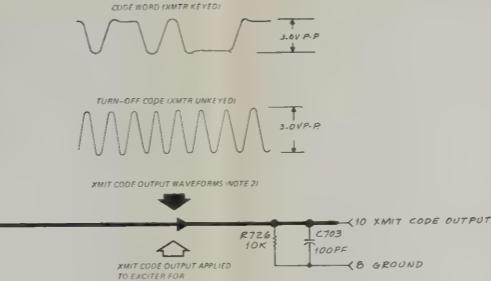
NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM SOLDER SIDE
SOLDER SIDE © 1971-CEPS-17053-C
OL-CEPS-17054-B



TECHNICIANS WHO HAVE NOT PREVIOUSLY SERVICED "DIGITAL PRIVATE-LINE" CIRCUITS ARE INVITED TO ORDER MOTOROLA BOOKLET MP1106E3 (ENTITLED "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH) WHICH COVERS THE FUNDAMENTALS OF SYSTEM OPERATION, CIRCUIT OPERATION AND SERVICING TECHNIQUES. USE THE TEAR-OUT ORDER BLANK AT THE FRONT OF THIS MANUAL TO ORDER YOUR FREE COPY.



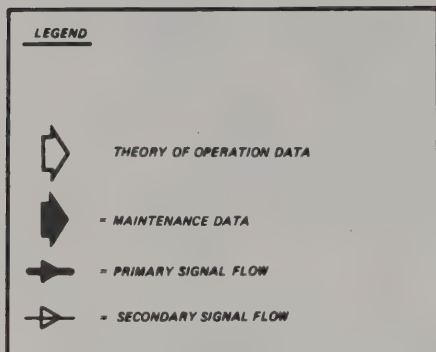
- NOTES:
1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS.
 2. THE Q703-Q704 OUTPUT WAVEFORMS WILL BE CONTINUOUS RATHER THAN SHORT BURSTS. THIS SAMPLE CODE WAVEFORM SHOWN IS ONLY A SMALL PORTION OF THE OVERALL.
 3. CABLE W1 IS PART OF PAGING OPTION.

SIMPLEX "DIGITAL PRIVATE-LINE" ENCODER MODEL TTN6003A

- APPLICATION --
- "Micor" Base Stations with Simplex "Digital Private-Line" Binary-Coded Squelch.
- FUNCTION --
1. Interfaces code word generator (located on "Digital Private-Line" Decoder Board) to the exciter, provides low pass active filter for 23-bit binary code word.
 2. Generates delayed keyed A+ (180 millisecond transmitter turn-off delay).

"DIGITAL PRIVATE-LINE" ENCODER BOARD TROUBLESHOOTING CHART		
SYMPTOM	PROBABLE CAUSES	ACTION
No delayed keyed A+ to exciter board.	1. No keyed A+ to encoder board (pin 2). 2. Malfunction in delayed keyed A+ generation circuitry.	Check keyed A+ at pin 10 of P902 on exciter board. Check delayed turn-off switch, delay generator and keying switch operation on encoder board.
Delayed keyed A+ remains high less than 160 msec or longer than 220 msec after unkeying.	Malfunction in delayed keyed A+ circuits.	Check C710. Then check delay generator circuit.
No Output on Xmit code out (pin 10), keyed or unkeyed.	1. No input to encoder board pin 6 from decoder board. 2. Faulty inverter (C702). 3. Active filter malfunction.	On decoder board, check U801-5 for code signal. Check for 6.0 V dc at U801-24. If 6.0 V dc is present, check 50 kHz clock for proper operation (U801-4). If clock is ok, replace U801. Check inverter operation. Check Q703, Q704 operation.
Code (not turn-off code) is on encoder board pin 10 when the radio is unkeyed.	U801 code generator on decoder board is not switching.	On decoder board, ground U801 9. If code is still present at U801-5, check 50 kHz clock output (U801-4). If clock is ok, replace U801.
Turn-off code (not code) is on encoder board pin 10 when the radio is keyed.	U801 code generator on decoder board is not switching.	Apply +9.6 V at J805 on decoder board. If turn-off code is still present at U801-5, replace U801.
Excessive "code sound" heard at the speaker of radio listening to this transmitter.	1. Code deviation is greater than ±1 kHz. 2. Low pass active filter is not switching from 140 Hz to 85 Hz.	Check for proper waveform amplitude at encoder board pin 10 (Xmit code out). Replace Q705.
Squelch tails are heard at the speaker of a radio listening to this transmitter.	1. No turn-off code is being transmitted. 2. Low pass active filter is always switched low (85 Hz).	Check the delayed keyed A+ duration (170-250 msec). Then check U801-5 on decoder board for presence of the turn-off code. Replace Q705.
No other radios in the system are enabled by this transmitter; code is being transmitted.	Wrong code is being transmitted.	Feed U801-5 from decoder board into a Motorola model SLN6413A "Digital Private-Line" test set. Check for proper decode. If proper decode is not obtained. Check for an intermittent or bad code plug (TRN6005A) or resistor network (Z801) on the decoder board. Check U801-15 thru U801-23 for a proper octal code.

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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5725A Encoder Board

PL-3300-A

C701	21-82610C58	<u>CAPACITOR, fixed: uF;</u> 100 pF $\pm 10\%$; 100 V
C702	21-82133G24	20 pF $\pm 5\%$; 500 V
C703	21-82428B09	.0047 $\pm 10\%$; 100 V
C704, 709	21-82187B22	270 pF $\pm 10\%$; 200 V
C705	8-83813H14	.043 $\pm 5\%$; 50 V
C706	8-83813H24	.036 $\pm 5\%$; 50 V
C707	8-83813H27	.0033 $\pm 5\%$; 50 V
C710	23-82783B24	15 $\pm 10\%$; 25 V
C711	21-82372C04	.05 $\pm 10\%$; 25 V
CR701, 702	48-83654H01	<u>DIODE:</u> (SEE NOTE) silicon
Q701	48-869652	<u>TRANSISTOR:</u> (SEE NOTE) field-effect; M9652
Q702, 703, 705, 706	48-869642	NPN; type M9642
Q704, 707	48-869643	PNP; type M9643
Q708	48-869328	PNP; type M9328
R701, 704	6-124D14	<u>RESISTOR, fixed: $\pm 5\%$; 1/4 W;</u> unless otherwise stated
R702	6-124C77	470k $\pm 10\%$
R703	6-124D04	15k $\pm 10\%$
R705	6-124A83	180k $\pm 10\%$
R706	6-124B02	27k
R707	6-124C85	150k
R708, 709, 711	6-124A81	33k $\pm 10\%$
R710, 717	6-124A89	22k
R712, 713	6-124A97	47k
R714	6-124A73	100k
R715	6-124C97	10k
R716	6-124C73	100k $\pm 10\%$
R718	6-124C37	10k $\pm 10\%$
U701	51-84267A82	330 $\pm 10\%$
VR701	48-83696F07	<u>INTEGRATED CIRCUIT:</u> (SEE NOTE) type M6782
Y701	48-82003K01	<u>VOLTAGE REGULATOR:</u> Zener; 6.2 V
Z701	1-80772B36 or 51-82142K02	<u>CRYSTAL:</u> resonator; 50.000 KC
Z702	1-80772B35 or 51-82142K01	<u>RESISTOR NETWORK:</u> pull-up, 10-pin
MECHANICAL PARTS		push-to-talk, 10-pin
3-138162	SCREW, tapping; 4-40 x 3/8"; 2 used	
9-82071K01	SOCKET	
14-83878G01	PAD, transistor mounting	
42-82480K01	CLIP, edge; 10 used	

PRIVATE-LINE" ENCODER

31A

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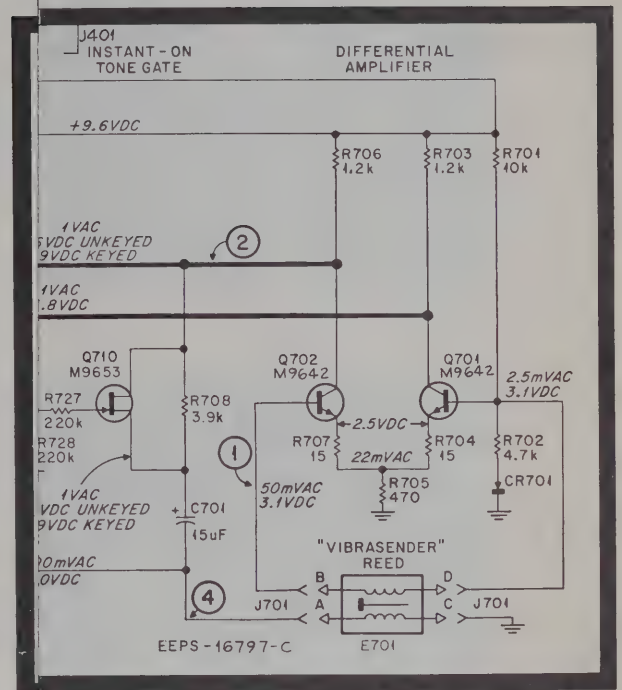
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f follower Q704
pedance ouput
external circuit

EPS-17757-B



ENCODER

1. ALL AC VOLTAGE MEASUREMENTS ARE RMS VALUES. ALL AC VOLTAGES ARE SINUSOIDAL EXCEPT Q708 EMITTER. METER READING DEPENDENT UPON METER RESPONSE TO NON-SINUSOIDAL WAVE.
2. DC VOLTAGE MEASUREMENTS IN Q705, Q706 AND Q707 STAGES TAKEN WITH RESPECT TO A-. VOLTAGES FOR ALL OTHER STAGES TAKEN WITH RESPECT TO CHASSIS GROUND. ALL DC VOLTAGES MAY BE MEASURED WITH 20,000 OHM-PER-VOLTMETER OR HIGH IMPEDANCE DC VOLTMETER (11 MEGOHM) EXCEPT BASE OF Q704 WHICH CAN ONLY BE MEASURED WITH A HIGH IMPEDANCE METER.
3. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.
4. PIN 701 IS USED ONLY FOR CERTAIN OPTIONAL EQUIPMENT.
5. PINS J401-6 AND -7 ON THE PL ENCODER MATE WITH PINS P401-11 AND -12 ON THE EXCITER.

NEPS-7051-B

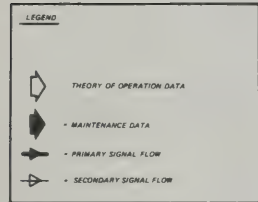
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(Sheet 1 of 2)
5/10/79-PHI

MODEL TLN5725A

FUNCTION
Generates "Digital Private-Line" Code for transmitter in duplex applications (where decoder and encoder may be on simultaneously). Develops 180 mS transmitter turn-off delay (delayed keyed A+).



TECHNICIANS WHO HAVE NOT PREVIOUSLY SERVICED "DIGITAL PRIVATE-LINE" CIRCUITS ARE INVITED TO ORDER MOTOROLA BOOKLET 689PS1106583 (ENTITLED "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH), WHICH COVERS THE FUNDAMENTALS OF SYSTEM OPERATION, CIRCUIT OPERATION AND SERVICING TECHNIQUES. USE THE TEAR-OUT ORDER BLANK AT THE FRONT OF THIS MANUAL TO ORDER YOUR FREE COPY



REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
PARTS LIST		
TL59754 Encoder Board		Pl.-1
C796	21-82410C58	<u>CAPACITOR, fixed: 1F</u> 10 pF ±1% 100 V
C792	21-12133G24	10 pF ±5%, 500 V
C793	21-12428B09	.0047 ±10%; 100 V
C794, 799	21-82410F02	270 pF ±10%; 200 V
C795	8-82011B14	.043 ±5%; 50 V
C798	8-82011H24	.036 ±5%; 50 V
C797	8-82011H27	.0033 ±5%; 50 V
C790	21-82784B24	±5 ±10% 15 V
C711	21-4-472C04	.05 ±10% 25 V
Ch701, 702		<u>DR.DIE: SEE NOTE</u> silicon
Q791	48-4-8752	<u>TRANSISTOR, SET</u> 110-0-attest, NPN-2
Q702, 703, 705, 706	48-4-8752	NPN, type M9328
Q704, 707	48-4-87643	PNP, type M9643
Q708	48-4-87626	PNP, type M9328
R701, 702		<u>RESISTOR, fixed: 100K</u> unless otherwise stated
R703	1-124D14	470K ±10%
R704	1-124C7	15K ±10%
R705	1-124D04	180K ±10%
R706	1-124A83	27K
R707	1-124B02	150K
R708	1-124C05	50K ±10%
R708, 709, 711	6-124A83	22K
R710, 717	6-124A89	42K
R712, 713	6-124A87	100K
R714	6-124A73	10K
R715	6-124C37	100K ±10%
R716	6-124C73	10K ±10%
R718	1-124C47	330 ±10%
U701		<u>INTEGRATED CIRCUIT</u> SEE NOTE type 74S2
VR701		<u>VOLTAGE REGULATOR</u> Zener: 6.2 V
Y701		<u>CRYSTAL</u> resonator: 50,000 KC
Z701		<u>RESISTOR NETWORK</u> pull-up, 10-pin
Z702		1-80772B35 or 51-82142X35 1-80772B35 or 51-82142X01 push-to-talk, 10-pin
3-138162		<u>MECHANICAL PARTS</u> SCREW, tapping: 4-40 x 3/2 used
9-82071K01		SOCKET
14-83878A01		PAD, transistor mounting
42-82480K01		CLIP, edge: 10 used

68P81028E64-D
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TECHNICAL CHARACTERISTICS	
"PL" TONE FREQUENCY	Selected from 67-210 Hz range
FREQUENCY DETERMINING DEVICE	"Vibrasender" Resonant Reed
STABILITY	± 0.15%
LEVEL (nominal)	350 mV rms
OUTPUT IMPEDANCE	4.7k ohms
POWER REQUIREMENTS	+ 9.6 V dc @ 15 mA

1. DESCRIPTION

The "Private-Line" (PL) encoder generates a low-frequency audio tone for continuous modulation of the transmitted rf signal in "Private-Line" operation.

2. FUNCTIONAL OPERATION

2.1 GENERAL

The encoder may be divided into three major sections.

Tone Oscillator -- The tone oscillator generates two equal-amplitude tone signals 180° out-of-phase whenever power is applied to the radio. A feedback amplifier provides negative feedback to limit the level of oscillation. The "Vibrasender" resonant reed determines the frequency of operation.

Reverse Burst Timing Generator -- The reverse burst timing generator provides a transmitter turn-off delay of approximately 150 milliseconds after the transmitter is unkeyed. During this period, a shifted phase tone (reverse burst) is developed in the tone output circuit which dampens the oscillations of the "Vibrasponder" resonant reed in listening receivers to eliminate the "squelch tail" noise burst at the end of the message.

Tone Output Circuit -- The tone output circuit provides a fixed level tone output to the modulator of the transmitter and shifts the phase of the tone during the reverse burst period to rapidly dampen the "Vibrasponder" resonant reeds in listening receivers.

2.2 TONE OSCILLATOR

The tone oscillator operates continuously while the station is "on". The outputs of the differential amplifier, formed by Q701 and Q702, are identical but 180° out of phase. The amplitudes of these collector signals are independent of frequency. A positive feed-

back signal is coupled through C701 and R708 which biases Q710 on through R727. To quickly bring the tone output up to full output, Q710 acts as a shunt around R708, which increases the positive feedback. After approximately 1.5 seconds (voltage across C710 reaches 9.0 volts) Q710 turns off and has no further effect on circuit operation. The output of Q701 is applied to feedback amplifier Q708 through C704 and R712. When the signal level exceeds a fixed amount, Q708 is biased into operation. It provides a negative feedback signal which keeps the oscillator out of limiting, thus provided a sinusoidal wave output. The "Vibrasender" resonant reed is the frequency determining device of the oscillator. It acts as a very high Q, narrow bandpass transformer, coupling only its resonant frequency and blocking all others. At its resonant frequency, the reed vibrates to couple energy from the primary to the secondary winding.

2.3 REVERSE BURST TIMING CIRCUIT

In the unkeyed transmitter condition, delay generator, Q706, is forward biased through CR703 and R719 to A- placing A+ across R721. This voltage is coupled to the base of the delayed turn-off switch (Q707) by R722, and Q707 is biased "off".

When the PTT button is closed, keyed filtered A+ is applied to R716 and turns on the keying switch, Q705. With Q705 acting as a short circuit:

--Q707 is biased "on" through R723, CR702 and Q705 to A-.

--Keyed, filter A+ is applied through Q707 to turn on the transmitter.

--C708 charges from the filtered A+ line through Q706 base-emitter junction, CR730 and R718.

--The PL switch gate, Q709, is turned on by bias current through R726 and Q705. This action turns off PL tone gate, Q703.

Note that Q706 has not changed states and is still turned on by bias current through R719.

When the PTT button is released, the keyed, filter A+ bias is removed from Q705 and it turns off. The transmitter continues to receive A+ from Q707 during the following sequence of events; with Q705 turned off:

--The PL switch gate, Q709, is turned off, activating the PL tone gate, Q703, which passes the reverse burst tone signal.

--C708 discharges through R718, R719, R721, R722 and R723, back biasing CR703 and turning off Q706.

--With Q706 off, Q707 remains on by receiving base bias through R722 and R721.

--After approximately 150 milliseconds, the voltage across C708 decreases to the point where Q706 turns on again and applies A+ across R721.

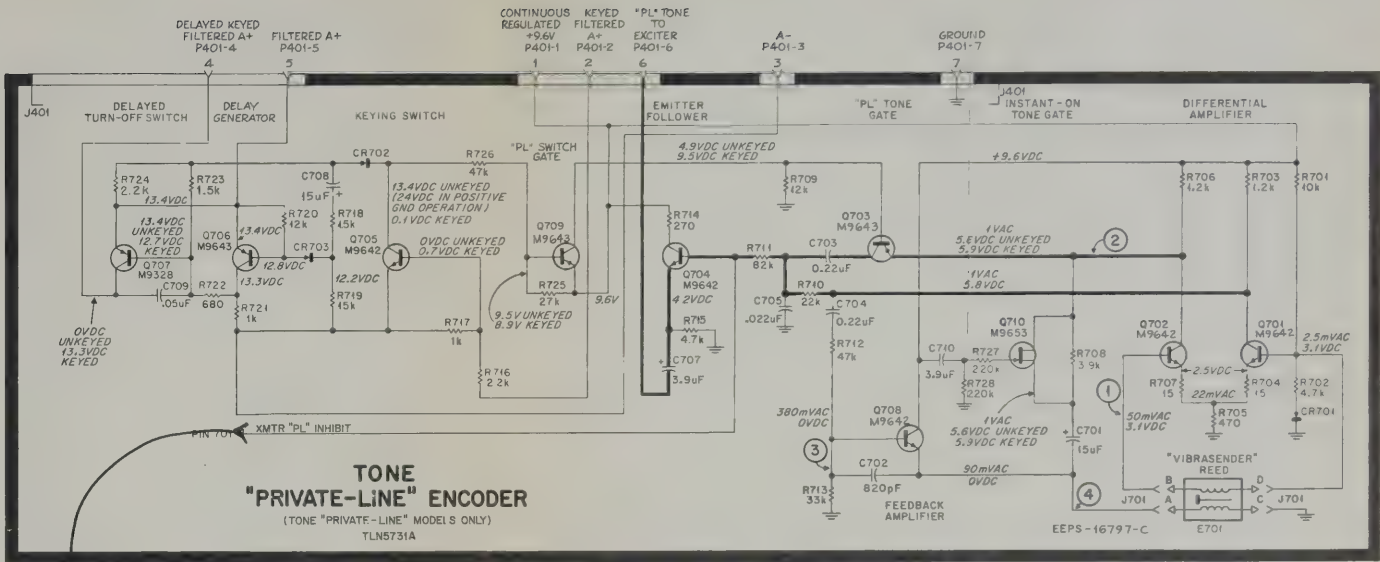
--The A+ across R721 turns off Q707 which removes the delayed keyed filter A+ from the transmitter.

2.4 TONE OUTPUT CIRCUIT

When the transmitter is keyed, PL gate switch Q709 is turned on. Q709, in turn, gates 9.6 volts to PL tone gate Q703, turning it off. When Q703 is turned off, only the output of Q701 is coupled to emitter follower Q704. When the transmitter is unkeyed, Q709 is turned off and Q703 is turned on which completes the tone path from Q702 to C703. The two tone signals 180° out of phase, combine through the phase shift capacitors to produce a signal to the emitter follower that is 240° out of phase with the original tone. Emitter follower Q704 provides impedance matching in a low impedance output and isolates the tone oscillator from the external circuit to which the tone output is applied.

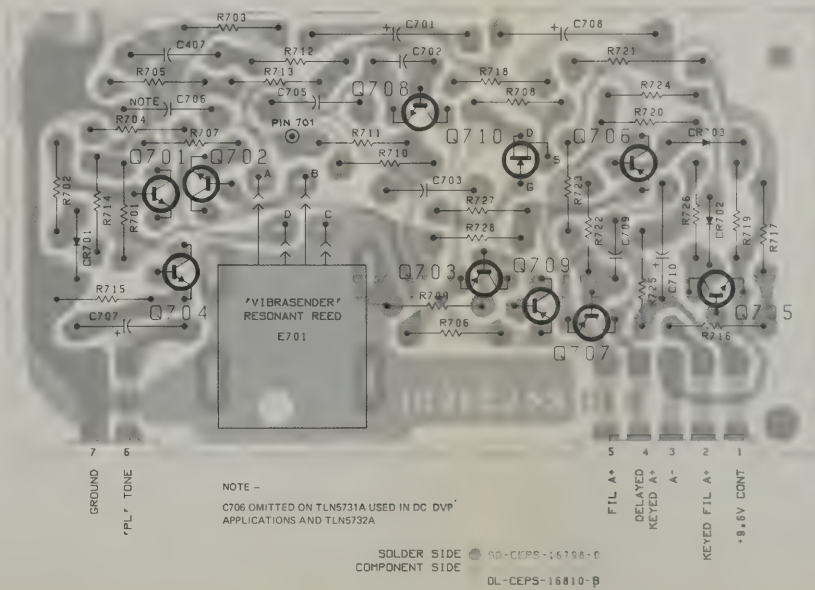
TONE "PRIVATE-LINE" ENCODER

MODEL TLN5731A



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SHOWN FROM SOLDER SIDE



"PL" ENCODER

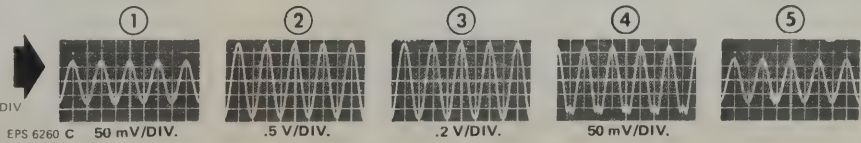
- ALL AC VOLTAGE MEASUREMENTS ARE RMS VALUES. ALL AC VOLTAGES ARE SINUSOIDAL EXCEPT Q706 EMITTER. METER READING DEPENDENT UPON METER RESPONSE TO NON-SINUSOIDAL WAVE.
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- PIN 701 IS USED ONLY FOR CERTAIN OPTIONAL EQUIPMENT.
- PINS 401-6 AND -7 ON THE PL ENCODER MATE WITH PINS 401-11 AND -12 ON THE EXCITER.

NEPS-7051-B

EPS-17757-B

TONE "PL" ENCODER WAVEFORMS

OSCILLOSCOPE WAVEFORMS MEASURED UNDER FOLLOWING CONDITIONS:
1. WAVEFORMS SHOWN USING 100 Hz "VIBRASENDER" RESONANT REED
2. VERTICAL SENSITIVITY SHOWN UNDER EACH WAVEFORM
3. HORIZONTAL DEFLECTION = 5 msec/DIV
4. ALL WAVEFORMS MEASURED IN RESPECT TO CHASSIS GROUND



NOTE --
C706 OMITTED ON TLN5731A USED IN DC DVP APPLICATIONS AND TLN5732A

SOLDER SIDE
COMPONENT SIDE
DL-CEPS-16810-B

68P81026E71-H
(Sheet 1 of 2)
5/10/79-PHI

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TRANSMITTER SHIELD

TLN1434A

PARTS LIST

TLN4739A Board & Panel Kit (p/o TLN1434A) PL-174

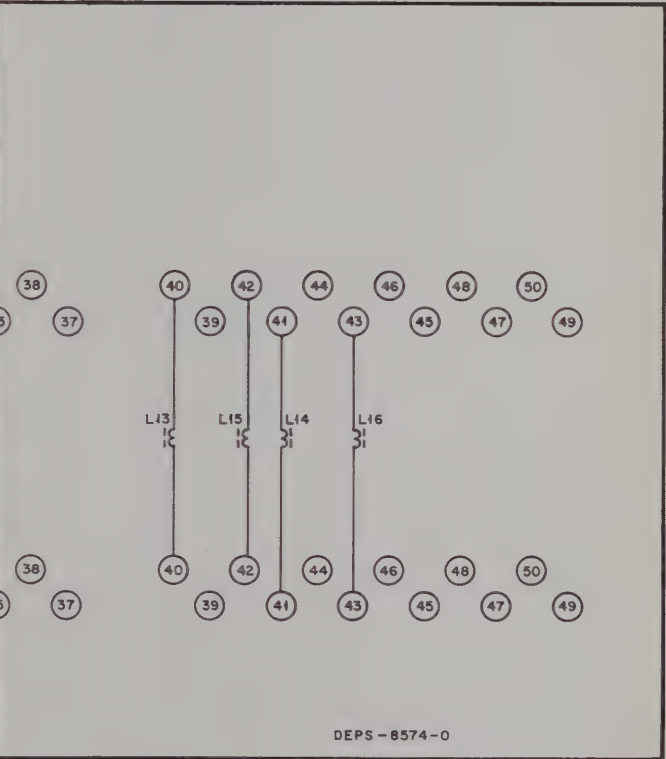
C1 thru 8, 10 thru 24, 26 thru 32 C9, 25	21-82543H01	CAPACITOR, fixed: 1500 pF +100-0%; 500 V
	21-82543H05	470 pF±20%;500 V(YEL-VIO- COIL, RF: choke;
L1, 2, 3, 5, 7, 8, 11, 13, 14	24-83977B01	1-1/2 turns thru ferrite bead
L4, 6, 9, 10, 12, 15, 16	24-83961B01	3 turns over ferrite bead; coded BRN

MODEL COMPLEMENT		
SUFFIX	DESCRIPTION	
8A	FILTER CHASSIS AND HARDWARE KIT	
9A	BOARD AND PANEL KIT	

EPS-21030-C

TLN4738A Filter Chassis and Hardware Kit PL-3547-

43-83281F01	BUSHING; 2 req'd.
27-84171D01	CHASSIS, filter
15-84169D01	COVER, filter
14-84173D01	INSULATOR, filter cable
4-8412	LOCKWASHER #4 split; 10
4-7607	WASHER, flat .125-.281 x 4 req'd.
3-134168	SCREW, tapping 4-40 x 1/4 Phillips; 2 req'd.
3-134309	SCREW, tapping 4-40 x 3/16 Phillips; 12 req'd.
3-114834	SCREW, machine 4-40 x 1" 2 req'd.
2-9627	NUT, 4-40 x 3/16" x 3/32" 8 req'd.
3-15728A24	SCREW, machine; 4-40 x 5/16" 6 req'd.
32-84410D01	SHIM, silicon, rubber; 4 r
42-84431D01	CLAMP, flat wire
42-84431D02	CLAMP, flat wire



REVISIONS

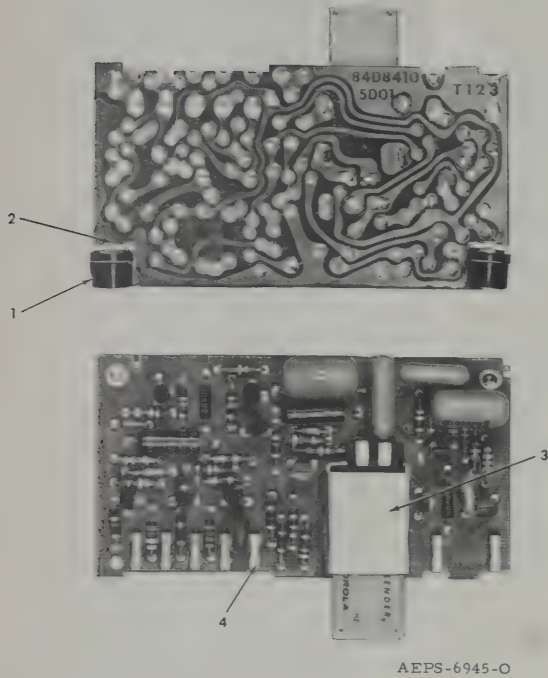
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1434A (TLN4739A-1)	C9, 25	FROM 21-82543H01, 1500 pF TO 21-82543H05, 470 pF	PARTS LIST

service publications
1301 E. Algonquin Road, Schaumburg, IL 60172

68P81015E21-D

TONE “PRIVATE-LINE” ENCODER

MODEL TLN5731A



MECHANICAL PARTS LIST

TLN5731A and TLN4293B
"Private-Line" Encoder

CODE	MOTOROLA PART NO.	DESCRIPTION
1	42-84284B01	RETAINER, screw: 2 req'd
2	3-138162	LOCKSCREW, tapping: No 4 x 3/8" Phillips hex head; 2 req'd
3	42-84116B02	SOCKET & BRACKET ASSEM- BLY: for "Vibrasender"
4	9-83011H01	Resonant Reed TERMINAL, pin: female 7 req'd

68P81026E71-H
(Sheet 2 of 2)
5/10/79-PLH

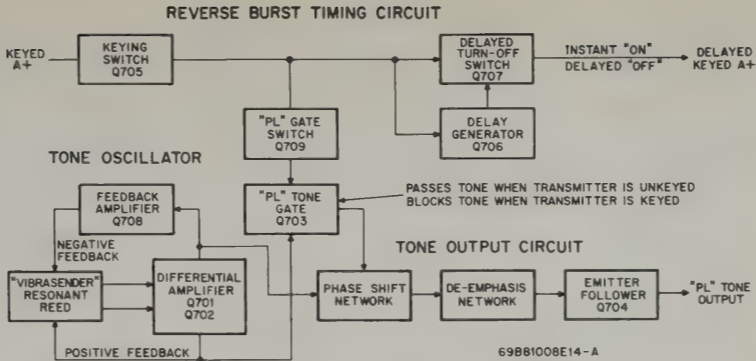
REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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ELECTRICAL PARTS LIST

TLN5731A Tone "Private-Line" Encoder		PL-3260-D
C701	23-84762H09	CAPACITOR, fixed: μF ; $\pm 10\%$; 50 V; unless otherwise stated
C702	21-82187B23	15 $\pm 20\%$; 20 V
C703, 704	8-82905G32	820 pF; 500 V
C705	8-83813H08	0.22
C706		.022
C707	23-84762H08	NOT USED
C708	23-83214C26	3.9 μF $\pm 20\%$; 15 V
C709	21-82372C04	15; 25 V
C710	23-84762H08	.05; ± 80 -20%; 75 V
		3.9 μF $\pm 20\%$; 15 V
CR701, 702, 703	48-83654H01	DIODE: (SEE NOTE I) silicon
J401		CONNECTOR, receptacle: consists of 7 female contact terminals (Part No. 9-83011H01) mounted on edge of circuit board
E701	KLN6210A	"VIBRASENDER" RESONANT REED: (SEE NOTE II) "plug-in" unit
Q701, 702	48-869570	TRANSISTOR: (SEE NOTE I) NPN; type M9570
Q703	or 48-869642	NPN; type M9642
Q704, 705	48-869571	PNP; type M9571
Q706	or 48-869643	PNP; type M9643
Q707	48-869570	NPN; type M9570
Q708	or 48-869642	NPN; type M9642
Q709	48-869571	PNP; type M9571
Q710	or 48-869643	PNP; type M9643
	48-869653	FET; type M9653
R701	6-124A73	RESISTOR, fixed: $\pm 5\%$; 1/4 W; unless otherwise stated
R702	6-124A65	10k
R703, 706	6-124A51	4.7k
R704	6-124A05	1.2k
R705	6-124A41	15
R707	6-124A05	470
R708	6-124A63	15
R709	6-124C75	3.9k
R710	6-124A81	12k $\pm 10\%$
R711	6-124A95	22k
R712	6-124A89	82k
R713	6-124A85	47k
R714	6-124C35	33k
R715	6-124A65	270 $\pm 10\%$
R716	6-124C57	4.7k
R717	6-124C49	2.2k $\pm 10\%$
R718	6-124A53	1k $\pm 10\%$
R719	6-124A77	1.5k
R720	6-124A75	15k
R721	6-124A75	12k
R722	6-125A49	1k; 1/2 W
R723	6-124A45	680
R724	6-124A53	1.5k
R725	6-124C57	2.2k $\pm 10\%$
R726	6-124C83	27k $\pm 10\%$
R727, 728	6-124C89	47k $\pm 10\%$
	6-124D06	220k $\pm 10\%$

NOTES:

- I. For optimum performance, replacement diodes and transistors must be ordered by Motorola part number.
- II. The "Vibrasender" Resonant Reed (Model KLN6210A) is not a part of the encoder board. When ordering a complete board, the reed must be ordered separately.



MAINTENANCE

a. Recommended Test Equipment

- (1) Motorola SLN6221A "Private-Line" Tone Generator -- used for testing "Vibrasender" resonant reeds.
- (2) Motorola Solid-State AC Voltmeter -- used for tone level measurement.
- (3) General purpose oscilloscope -- valuable for signal tracing and locating sources of distortion.
- (4) Motorola Solid-State DC Multimeter -- used for dc voltage measurement.
- (5) Motorola S1343 Series Frequency Counter or S1344 Series Frequency Counter/Deviation Meter -- used for measuring PL tone frequency.

b. Performance Test

Measure frequency deviation of the transmitter in which the PL encoder is installed. With the transmitter keyed and PL tone modulation (only), deviation should read ± 0.5 to ± 1.0 kHz.

c. Troubleshooting

- (1) If no deviation is measured the trouble may lie in the tone oscillator or tone output circuit. The trouble may be isolated by the following steps.

- (a) Check 9.6-volt input to encoder.

- (b) Check ac signal voltage at collector of Q701.

- (c) If signal is present, check Q704.

- (d) If no signal is present any component in the oscillator loop could cause the trouble. Check the "Vibrasender" resonant reed in the SLN6221A "Private-Line" Tone Generator.

- (e) If the tone generator does not produce an output signal the reed is defective.

- (f) If the reed is good, replace it in the encoder and make dc voltage measurement in the tone oscillator circuit to locate the defective components.

- (2) If low deviation is measured, check ac signal voltages and compare them with the chart readings to find the source of trouble.

- (3) If deviation is normal, but calls are not being received, check the frequency of the PL encoder tone. If off-frequency, replace the "Vibrasender" resonant reed.

- (4) If squelch tail noise bursts are heard by all listening receivers, check dc voltages of Q703 and Q706 is keyed and unkeyed conditions.

- (5) If the transmitter cannot be keyed, and the trouble has been isolated to the PL encoder board, measure dc voltages in Q705 and Q707 stages.

- (6) If too much tone deviation is measured, check feedback amplifier Q708.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

PARTS LIST

TLN4739A Board & Panel Kit (p/o TLN1434A) PL-1708-C

C1 thru 8, 10 thru 24, 26 thru 32 C9, 25	21-82543H01	CAPACITOR, fixed; 1500 pF +100-0%; 500 V
L1, 2, 3, 5, 7, 8, 11, 13, 14 14 6, 9, 10, 12, 15, 16	21-82543H05	470 pF±20%;500 V(YEL-VIO-BRN COIL, RF: choke; 1-1/2 turns thru ferrite block
	24-83977B01	1-1/2 turns thru ferrite block
	24-83961B01	3 turns over ferrite bead; coded BRN

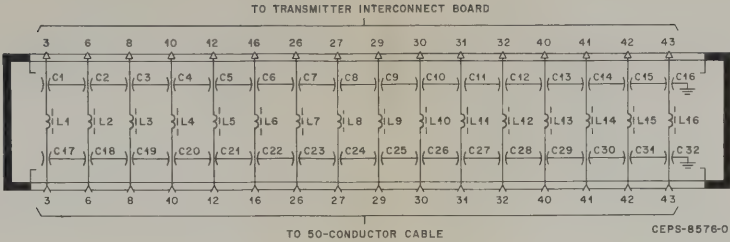
TLN4738A Filter Chassis and Hardware Kit PL-3547-0

43-83281F01	BUSHING; 2 req'd.
27-84171D01	CHASSIS, filter
15-84169D01	COVER, filter
14-84173D01	INSULATOR, filter cable
4-8412	LOCKWASHER #4 split; 10 req'd
4-7607	WASHER, flat .125-.281 x .027"
	4 req'd.
3-134168	SCREW, tapping 4-40 x 1/4",
	Phillips; 2 req'd.
3-134309	SCREW, tapping 4-40 x 3/16",
	Phillips; 12 req'd.
3-114834	SCREW, machine 4-40 x 1";
	2 req'd.
2-9627	NUT, 4-40 x 3/16" x 3/32" Hex;
	8 req'd.
3-15728A24	SCREW, machine; 4-40 x 5/8";
	6 req'd.
32-84410D01	SHIM, silicon, rubber; 4 req'd.
42-84431D01	CLAMP, flat wire
42-84431D02	CLAMP, flat wire

REVISIONS 68P81015E21-C			
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1434A TLN4739A-1)	C9, 25	FROM 21-82543H01, 1500 pF TO 21-82543H05, 470 pF	PARTS LIST

TRANSMITTER SHIELD

TLN1434A

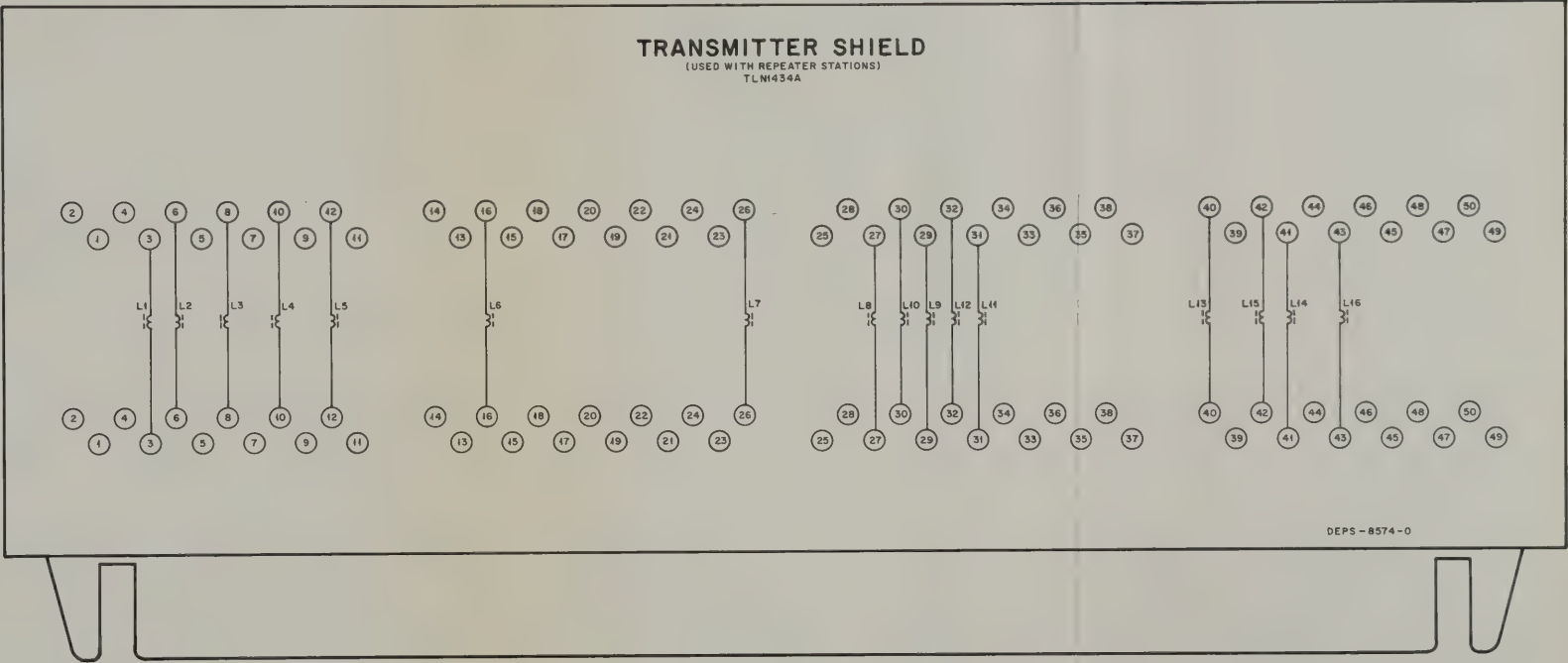


MODEL COMPLEMENT		
MODEL	SUFFIX	DESCRIPTION
TLN4738A		FILTER CHASSIS AND HARDWARE KIT
TLN4739A		BOARD AND PANEL KIT

EPS-21030-O

TRANSMITTER SHIELD

TLN1434A
(USED WITH REPEATER MODELS ONLY)
ALL CAPACITOR VALUES ARE 470 pF



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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN4728A/TLN5605A

Xmtr. Chassis & Heat Sink

PL-1838-

1-80728B50	CHASSIS ASSEMBLY; includes: 7-84221B01 BRACKET 26-84198B02 HEATSINK 27-84349D01 CHASSIS 1-80728B01 BRACKET ASSEMBLY; includes: BRACKET ref. items C902, C904, C907 & C909
27-84350D01	CHASSIS
7-84354D01	BRACKET
41-84144C01	SPRING, retaining
3-50378	TERMINAL STRIP
14-84210A01	INSULATOR
4-84152B01	WASHER, shoulder
14-84290B01	INSULATOR, pa
26-84588B01	SHIELD
43-84219C01	SPACER
55-84300B01	HANDLE

NOTE:

Electrical components for TLN4728A & TLN5605A are listed in the Power Amplifier and Transmitter Interconnect sections.

TLN4730A Xmtr. Hardware Kit

PL-1774-O

1-80709B41	SHIELD ASSEMBLY
1-80731B73	SHIELD ASSEMBLY, excite
3-84141D01	SCREW, captive; 4 req'd
15-84352D01	COVER, rear; xmtr.
15-84300B01	COVER, bottom, xmtr.
55-84300B01	HANDLE, large
55-84300B02	HANDLE, small

TLN4741A/TLN5604A PA Hardware Kit

PL-1834-A

1-80727B91	BRACKET ASSEMBLY (TLN4741A), includes 7-84407D01 BRACKET ref items C571, C572, & C573
1-80709D90	BRACKET ASSEMBLY (TLN5604A), includes: 7-82379M01 BRACKET ref items C571, C572 & C573
9-84234E10	JACK, test; white; 3 req'd.
26-84402D01	SHIELD
14-84290B02	INSULATOR

NOTE:

Electrical components for TLN4741A & TLN5604A are listed in the Power Amplifier and Power Control sections.

TLN4742A Hardware Kit

PL-1855-

1-80727B91	BRACKET ASSEMBLY; includ 7-84407D01 BRACKET, mounting 4-83755H01 WASHER, solder; 7 req'd ref. items C571, C572 & C573
9-84234E10	JACK, test; white; 3 req'd
26-84911L02	SHIELD, power amplifier

NOTE:

Electrical components for TLN4742A are listed in the Power Amplifier and Power Control sections.

TLN5074A Terminal Bracket Kit

PL-1857-C

7-84354D01	BRACKET, terminal board
31-50378	TERMINAL BOARD, 2 termin

NOTE:

Electrical components for TLN5074A are listed in the Power Amplifier section.

TRANSMITTER HARDWARE KITS

132-174 MHz

MODEL TABLE

TYPE OF STATION USED WITH			
INTERMITTENT DUTY	CONTINUOUS DUTY	60 W	HI PWR
X			X
X			X
X		X	X
	X		X
	X	X	
	X		X
	X	X	X
	X	X	X
X		X	
	X	X	X
X		X	X
	X	X	X
X		X	X

TRANSMITTER HARDWARE KITS

service publications

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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

PARTS LIST

TLN4728A/TLN5605A
Xmtr, Chassis & Heat Sink PL-1838-A

	1-80728B50	CHASSIS ASSEMBLY: includes: 7-84221B01 BRACKET 26-84198B02 HEATSINK 27-84349D01 CHASSIS 1-80728B01 BRACKET ASSEMBLY; includes: BRACKET ref. items C902, C904, C907 & C909 CHASSIS BRACKET SPRING, retaining TERMINAL STRIP INSULATOR WASHER, shoulder INSULATOR, pa SHIELD SPACER HANDLE
	27-84350D01	
	7-84354D01	
	41-84144C01	
	3-50378	
	14-84210A01	
	4-84152B01	
	14-84290B01	
	26-84588B01	
	43-84219C01	
	55-84300B01	

NOTE:

Electrical components for TLN4728A & TLN5605A are listed in the Power Amplifier and Transmitter Interconnect sections.

TLN4730A Xmtr. Hardware Kit PL-1774-O

	1-80709B41	SHIELD ASSEMBLY
	1-80731B73	SHIELD ASSEMBLY, excitea
	3-84141D01	SCREW, captive; 4 req'd
	15-84352D01	COVER, rear; xmtr.
	15-84300B01	COVER, bottom, xmtr.
	55-84300B01	HANDLE, large
	55-84300B02	HANDLE, small

TLN4741A/TLN5604A PA Hardware Kit PL-1834-A

	1-80727B91	BRACKET ASSEMBLY (TLN4741A), includes 7-84407D01 BRACKET ref items C571, C572, & C573
	1-80709D90	BRACKET ASSEMBLY (TLN5604A), includes: 7-82379M01 BRACKET ref items C571, C572 & C573
	9-84234E10	JACK, test; white; 3 req'd.
	26-84402D01	SHIELD
	14-84290B02	INSULATOR

NOTE:

Electrical components for TLN4741A & TLN5604A are listed in the Power Amplifier and Power Control sections.

TLN4742A Hardware Kit PL-1855-A

	1-80727B91	BRACKET ASSEMBLY; includes: 7-84407D01 BRACKET, mounting 4-83755H01 WASHER, solder; 7 req'd ref. items C571, C572 & C573
	9-84234E10	JACK, test; white; 3 req'd
	26-84911L02	SHIELD, power amplifier

NOTE:

Electrical components for TLN4742A are listed in the Power Amplifier and Power Control sections.

TLN5074A Terminal Bracket Kit PL-1857-C

	7-84354D01	BRACKET, terminal board
	31-50378	TERMINAL BOARD, 2 terminal

NOTE:

Electrical components for TLN5074A are listed in the Power Amplifier section.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

TLN4744A Exciter Hardware Kit PL-1829-O

	1-80727B99	FILTER ASSEMBLY: includes: 64-84014E01 PLATE, mounting 4-83755H01 WASHER, solder; 2 req'd ref. items C911 & C912
	1-80730B02	CHASSIS ASSEMBLY: includes: 27-84140D01 CHASSIS, exciter 1-80728B01 BRACKET ASSEMBLY includes: 7-84948D01 BRACKET 4-83755H01 WASHER, solder; 4 req'd ref. items C902, C904, C907 & C909 BRACKET COVER, exciter COVER, rear COVER, front SPRING, retaining
	7-84221B01	
	15-84165D01	
	15-84166D01	
	15-84301E01	
	41-84144C01	

NOTE:

Electrical components for TLN4744A are listed in the Transmitter Interconnect section.

TLN4822A Cable & Bracket Kit PL-1828-O

	1-80727B94	BRACKET ASSEMBLY: includes: 7-84405D01 BRACKET 9-84935D01 SOCKET, transistor 4-83755H01 WASHER, solder; 3 req'd ref. items C565, C566 & C570
	14-865875	INSULATOR, mica

NOTE:

Cable assemblies for TLN4822A are listed in the rf cables section; electrical components are listed in the Power Amplifier and Transmitter Interconnect sections.

TLN4781A Xmtr. Chassis & Heat Sink Kit PL-1836-O

	1-80728B50	CHASSIS ASSEMBLY: includes: 1-80728B01 BRACKET ASSEMBLY: includes: 7-84948D01 BRACKET 4-83755H01 WASHER, solder; 4 req'd ref items C902, C904, C907 & C909 7-84221B01 BRACKET 26-84198B02 HEATSINK 27-84349D01 CHASSIS
	27-84350D01	
	7-84354D01	
	41-84144C01	
	31-50378	
	14-84210A01	
	4-84152B01	
	14-84020C01	
	26-84588B01	
	43-84219C01	
	55-84300B01	
	4-83755H01	

NOTE:

Electrical components for TLN4781A are listed in the Power Amplifier and Transmitter Interconnect sections.

TRANSMITTER HARDWARE KITS

132-174 MHz

MODEL TABLE

MODEL	DESCRIPTION	TYPE OF STATION USED WITH			
		INTERMITTENT DUTY	CONTINUOUS DUTY	60 W	HI PWR
TLN4728A	CHASSIS & HEAT SINK	X			X
TLN5605A	CHASSIS & HEAT SINK	X			X
TLN4730A	XMTR HARDWARE KIT	X		X	X
TLN4741A	PA HARDWARE KIT		X		X
TLN4742A	PA HARDWARE KIT		X	X	
TLN5604A	PA HARDWARE KIT		X		X
TLN4744A	XCTR HARDWARE KIT		X	X	X
TLN4780A	PA CASTING & HARDWARE KIT		X	X	X
TLN4781A	XMTR CHASSIS & HEAT SINK	X		X	
TLN4822A	INPUT BRACKET & CABLE		X	X	X
TLN5074A	TERMINAL BRACKET	X		X	X
TRN6188A	"PL ENCODER HARDWARE KIT		X	X	X
TLN5902A	SHIELD, xmtr.		X	X	X
TRN6974A	SHIELD, xmtr.	X		X	X



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"PRIVATE-LINE" INHIBIT CABLE KIT

MODEL TKN6631A

DESCRIPTION

This cable kit is an 18 inch, single lead used in systems that inhibit the transmitted

"Private-Line" code in certain modes of operation (such as paging). Cable interconnection is between TLN5731A "Private-Line" Encoder pin 701 and TLN4729B/TLN4743B Transmitter Interconnect Unit pin 30.

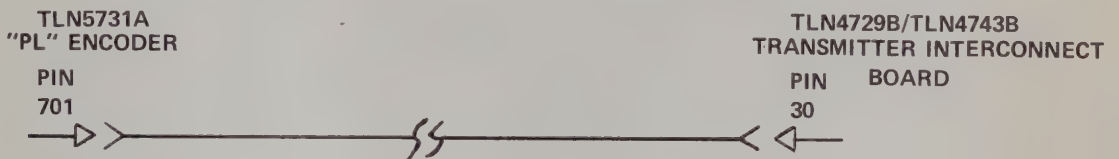


Figure 1. TKN6631A Cable Kit



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"PRIVATE-LINE" INHIBIT CABLE KIT

MODEL TKN6631A

DESCRIPTION

This cable kit is an 18 inch, single lead used in systems that inhibit the transmitted

"Private-Line" code in certain modes of operation (such as paging). Cable interconnection is between TLN5731A "Private-Line" Encoder pin 701 and TLN4729B/TLN4743B Transmitter Interconnect Unit pin 30.

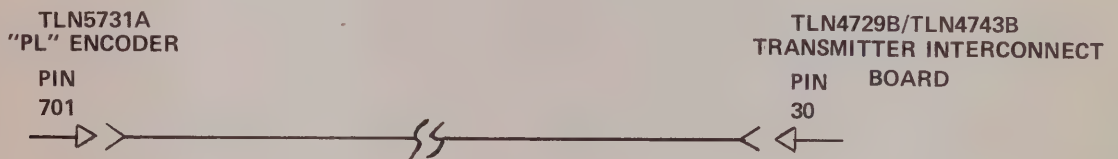


Figure 1. TKN6631A Cable Kit

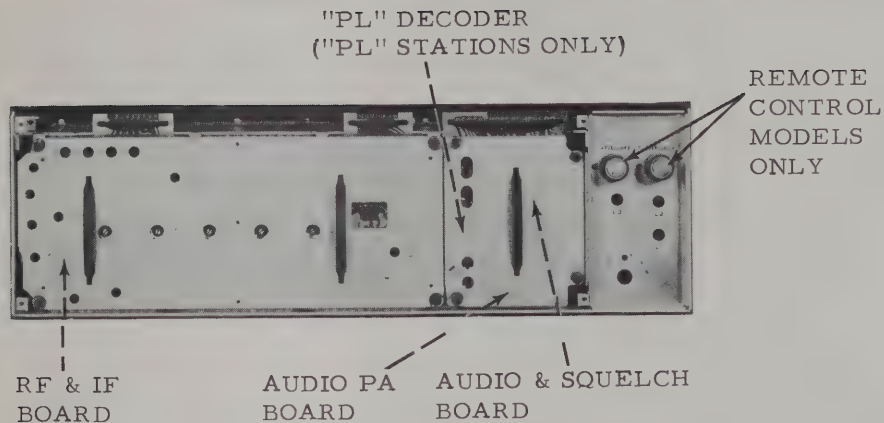


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RECEIVER INTRODUCTION

132-174 MHz



AEPS-9232-B

The receiver used in the "Micor" "Compa-Station" base and repeater stations consists of the items shown in the receiver model charts at the end of this section. All receiver items are assembled on a single chassis or "shelf" in the station. All receiver items are described in the following receiver instruction sections with the exception of rf intercabling which is detailed in the rf intercabling section at the front of this manual. The receiver chassis & hardware kit is parts listed at the end of this section.

Some stations include two receivers and in a few of these stations, one of the receivers may have a shifted i-f. This occurs when the separation between the two operating

carrier frequencies is mathematically related to the i-f. The receiver rf & i-f section gives specific conditions when this occurs. All two-receiver stations include a 2-receiver coupler which is described behind the STATION DIAGRAMS tab.

Stations operating in the 132-174 MHz range can use an optional rf preamplifier. The preamplifier increases the sensitivity of the receiver and is particularly useful in two-receiver stations. The preamplifier more than makes up the half power loss in each leg of the 2-receiver coupler. The rf preamplifier is described in detail in the instruction section 68P81016E33 of this manual.



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RECEIVER INTRODUCTION

MOTOROLA

RECEIVER
MODEL CHART

FOR

132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO

AND REPEATER STATIONS

(LATER VERSIONS)

"BB" SUFFIX MODELS

CODE:

☒ - ONE ITEM INCLUDED

		DESCRIPTION	
		ITEM	
		TLN5912A	HARDWARE KIT, 2ND RCVR
		TLN5655A	INTERCONNECT BOARD
		TKN6570A	RECEIVER RF CABLE
		TLN4727A	RECEIVER CHASSIS & HARDWARE ASSEMBLY
		TLN4290B	RECEIVER INTERCONNECT BOARD
		TLN4276B	AUDIO POWER AMPLIFIER
		TRN5006A	AUDIO & SQUELCH BOARD
		TLN8274B	RF & IF BOARD (162-174 MHz)
		TLN8273B	RF & IF BOARD (150.8-162 MHz)
		TLN8272B	RF & IF BOARD (142-150.8 MHz)
		TLN8271B	RF & IF BOARD (132-142 MHz)
MODEL	DESCRIPTION		
TRD1801BB	RECEIVER (132-142 MHz)		
TRD1802BB	RECEIVER (142-150.8 MHz)		
TRD1803BB	RECEIVER (150.8-162 MHz)		
TRD1804BB	RECEIVER (162-174 MHz)		
TLN1865A	2ND RECEIVER		

EPS-16887-C

MOTOROLA

RECEIVER
MODEL CHART

FOR

132-174 MHz

"MICOR" "COMPA-STATION" BASE RADIO

AND REPEATER STATIONS

(EARLIER VERSION)

"AB" SUFFIX MODELS

CODE:

☒ - ONE ITEM INCLUDED

MODEL	DESCRIPTION
TRD1801AB	RECEIVER (132-142 MHz)
TRD1802AB	RECEIVER (142-150.8 MHz)
TRD1803AB	RECEIVER (150.8-162 MHz)
TRD1804AB	RECEIVER (162-174 MHz)

ITEM	DESCRIPTION
TLD8271A	RF & IF BOARD (132-142 MHz)
TLD8272A	RF & IF BOARD (142-150.8 MHz)
TLD8273A	RF & IF BOARD (150.8-162 MHz)
TLD8274A	RF & IF BOARD (162-174 MHz)
TLN4725A	AUDIO & SQUELCH BOARD
TLN4726A	AUDIO POWER AMPLIFIER
TLN4727A	RECEIVER INTERCONNECT BOARD
TKN6570A	RECEIVER CHASSIS & HARDWARE ASSEMBLY
	RECEIVER RF CABLE

EPS-8818-B

UNIFIED CHASSIS RECEIVER INTERCONNECT BOARD

1. DESCRIPTION

The receiver interconnect board connects the receiver rf and i-f board and the receiver audio and squelch board to the station unified chassis interconnect board.

A number of jumpers are provided to allow use of the board in single and two-receiver stations, with "Digital PL" operation and for modified squelch operations. Jumper connections for these modes of operation are shown in the jumper chart on the receiver interconnect board schematic diagram.

2. "AND SQUELCH" OPERATION

An optional mode of receiver operation, known as "AND SQUELCH", can be added when desired. This feature provides "variable PL sensitivity" (coded squelch plus adjustable noise-activated carrier squelch.)

In this mode, the receiver audio channel is activated when a PL tone is received and the carrier squelch

threshold level is exceeded. Since the carrier (noise-activated) squelch circuit sensitivity is adjustable, and since it is one of the controlling factors in the squelching of receiver audio, the operation can be aptly described as "variable PL sensitivity". Thus, "AND SQUELCH" denotes both coded squelch and carrier squelch operating simultaneously.

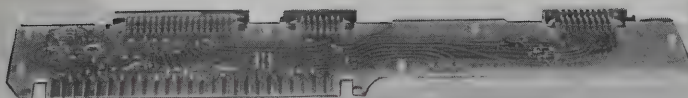
Conversion of the receiver to the "AND SQUELCH" mode of operation requires the addition of certain components to the receiver interconnect board, and the omission of certain jumpers on both the receiver interconnect board and the audio & squelch board.

The parts required to convert the receiver to "AND SQUELCH" operation are listed with the receiver interconnect board schematic diagram.

Refer to the Audio & Squelch Board section (68P81025E79) of this manual for further details relating to "AND SQUELCH" operation.

RECEIVER INTERCONNECT BOARD

MODEL TLN4726B



AEPS-8582-O

1. DESCRIPTION

The receiver interconnect board connects the receiver rf and i-f board and the receiver audio and squelch board to the station 50-conductor intercable.

A number of jumpers are provided to allow use of the board in single and two-receiver stations, and local and remote control stations. Jumper connections for these modes of operations are shown in Table 1.

2. "AND SQUELCH" OPERATION

An optional mode of receiver operation known as "AND SQUELCH" can be added when desirable. This feature provides "variable PL sensitivity" (tone-coded squelch plus adjustable noise-activated [carrier] squelch).

In this mode, the receiver audio channel is activated when a PL tone is received and the carrier squelch threshold level is exceeded. Since the carrier (noise-activated) squelch circuit sensitivity is adjustable, and since it is one of the controlling factors in the squelching of receiver audio, the operation can be aptly described as "variable PL sensitivity". Thus "AND SQUELCH" denotes both tone-coded squelch and carrier squelch operating simultaneously.

Conversion of the receiver to the "AND SQUELCH" mode of operation requires the addition of certain components to the RECEIVER INTERCONNECT UNIT, and the omission of certain jumpers in both the RECEIVER INTERCONNECT UNIT and the AUDIO & SQUELCH BOARD.

The parts required to convert the receiver to "AND SQUELCH" operation are listed on the back of the schematic diagram.

Refer to the AUDIO & SQUELCH section of this manual for further details relating to "AND SQUELCH" operation.



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RECEIVER INTERCONNECT BOARD

TABLE 1.
JUMPER TABLE

JUMPER JU	SINGLE-RECEIVER STATION		TWO-RECEIVER STATION			
			RECEIVER #1		RECEIVER #2	
	REMOTE CONTROL	LOCAL CONTROL	REMOTE CONTROL	LOCAL CONTROL	REMOTE CONTROL	LOCAL CONTROL
951	NOTE 953					
952	IN	IN	IN	IN	IN	IN
953	IN	OUT	IN	OUT	OUT	OUT
954	IN	IN	OUT	IN	IN	OUT
955	IN	IN	OUT	OUT	IN	IN
956	IN	IN	IN	IN	OUT	OUT
957	*IN	OUT	*IN	OUT	OUT	IN
958	*IN	IN	*IN	IN	OUT	OUT
959	IN	OUT	OUT	OUT	IN	IN
960	IN	IN	IN	IN	OUT	OUT
961	IN	IN	IN	IN	IN	IN
962	IN	IN	IN	IN	IN	IN
963	IN	IN	IN	IN	OUT	OUT
964	IN	OUT	OUT	OUT	IN	IN
965	IN	IN	IN	IN	IN	IN
966	IN	IN	IN	IN	IN	IN
967	IN	IN	IN	IN	IN	IN
968	IN	IN	IN	IN	OUT	OUT
969	OUT	IN	OUT	OUT	OUT	IN
970	IN	IN	IN	IN	IN	OUT
971	OUT	IN	OUT	IN	OUT	IN
972	IN	IN	IN	IN	OUT	OUT
973	OUT -	IN	OUT	IN	OUT	OUT
974	OUT	IN	OUT	IN	OUT	IN

* = OUT FOR REPEATER STATIONS

REFERENCE
SYMBOL

PARTS LI

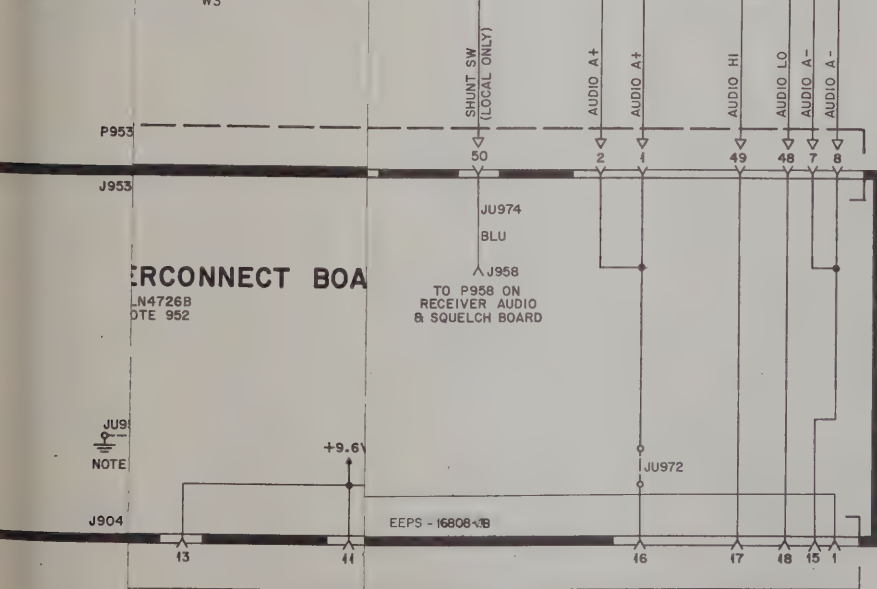
TLN4726B Rece

- C951
- C952, 953
- CR951 thru 954, 957
- J904
- J953
- JU951 thru JU972
- L951
- P954, 955-2, 955-3, 955-4, 955-5, 956-1, 956-2, 956-3, 957-1, 957-2, 957-3
- R951

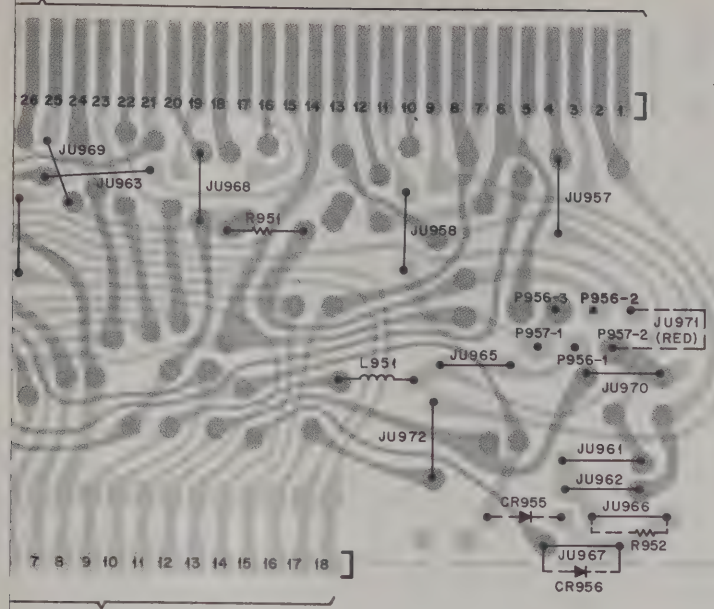
NOTE:

Replacem
number o

0-CONDUCTOR CABLE



50-CONDUCTOR CABLE



CONNECTS TO RECEIVER
AUDIO & SQUELCH BOARD

NOTES:

- 951. R960 VOLUME AND R961 SQUELCH CONTROLS ARE NOT USED IN LOCAL CONTROL STATIONS. THESE FUNCTIONS ARE PROVIDED ON THE LOCAL CONTROL PANEL.
- 952. JUMPER CONNECTIONS ARE AS LISTED ON RECEIVER INTERCONNECT BOARD JUMPER TABLE.
- 953. JU951 IS CONNECTED IN SINGLE FREQUENCY RECEIVERS ONLY. RECEIVER CHANNEL ELEMENT IS ALWAYS ACTIVATED.
- 954. CR955, CR956, & R952 ARE USED AND JUMPERS JU966 AND JU967 ARE OMITTED FOR "AND SQUELCH" OPERATION (JU204 ON AUDIO & SQUELCH BOARD MUST ALSO BE CUT) AND ARE NOT PART OF THE RECEIVER INTERCONNECT BOARD.
- 955. CR957 REMOVED FOR REPEAT OR DUPLEX OPERATION.
- 956. UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN PICOFARADS.

TLN4726B Receiver Interconnect Board
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-16959- D
6/20/80-PHI

TABLE 1.
JUMPER TABLE

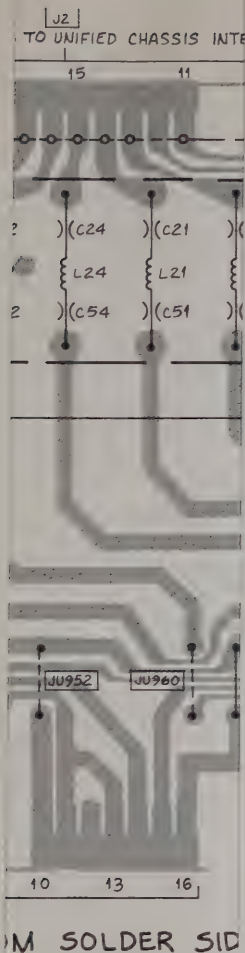
JUMPER JU	SINGLE-RECEIVER STATION		TWO-RECEIVER STATION			
	REMOTE CONTROL	LOCAL CONTROL	RECEIVER #1		RECEIVER #2	
			REMOTE CONTROL	LOCAL CONTROL	REMOTE CONTROL	LOCAL CONTROL
951	NOTE 953					
952	IN	IN	IN	IN	IN	IN
953	IN	OUT	IN	OUT	OUT	OUT
954	IN	IN	OUT	IN	IN	OUT
955	IN	IN	OUT	OUT	IN	IN
956	IN	IN	IN	IN	OUT	OUT
957	*IN	OUT	*IN	OUT	OUT	IN
958	*IN	IN	*IN	IN	OUT	OUT
959	IN	OUT	OUT	OUT	IN	IN
960	IN	IN	IN	IN	OUT	OUT
961	IN	IN	IN	IN	IN	IN
962	IN	IN	IN	IN	IN	IN
963	IN	IN	IN	IN	OUT	OUT
964	IN	OUT	OUT	OUT	IN	IN
965	IN	IN	IN	IN	IN	IN
966	IN	IN	IN	IN	IN	IN
967	IN	IN	IN	IN	IN	IN
968	IN	IN	IN	IN	OUT	OUT
969	OUT	IN	OUT	OUT	OUT	IN
970	IN	IN	IN	IN	IN	OUT
971	OUT	IN	OUT	IN	OUT	IN
972	IN	IN	IN	IN	OUT	OUT
973	OUT	IN	OUT	IN	OUT	OUT
974	OUT	IN	OUT	IN	OUT	IN

* = OUT FOR REPEATER STATIONS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLN5050A Optional "And Squelch" Parts		PL-2573-A
CR955	48-82392B03	<u>SEMICONDUCTOR DEVICE</u> , diode: (SEE NOTE)
CR955:	48-82392B03	silicon silicon
R952	0-129608	<u>RESISTOR</u> , fixed; 10k \pm 10%, 1/4 W
TLN5184A Extender On-Off Switch Kit		PL-5081-C
S1	40-82085703	<u>SWITCH, toggle</u> ; spd
<u>NON-REFERENCED ITEMS</u>		
	4-1725	WASHER, flat, .266 x .562 x .040; 2 used
	54-84861G01	LABEL: Extender On-Off

TLN4726B Receiver Interconnect Board
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-16959-D
6/20/80-PHI

RECEIVER INTERCONNECT BOARD



FUNCTION

— Interconnects various receiver circuit boards to the unified chassis interconnect board. Model differences are primarily rf filtering.

MODEL	APPLICATION
TLN5646A	With Repeater Stations
TLN5648A	With Base Stations (1st RCVR only)
TLN5655A	With Base Stations (2nd RCVR only)
TRN6196A (optional)	In place of TLN5646A or TLN5648A (provides additional filtering)
TRN6308A (optional)	In place of TLN5655A (provides additional filtering)

MODEL	TLN5646A	TLN5655A	TRN6196A	TRN6308A
THRU C80	NOT USED	C8, C10-C14, C19-C25, C27, C30, C35, C40, C44, C45-C55, C57, C60	C1 THRU C80	C1 THRU C80
L10, L13, L1-L30	NOT USED	L5, L10-L14, L18-L25, L27, L30	L1-L30	L1-L30

960 IS CUT FOR DIGITAL "PL" REPEATER STATIONS AND FULL DUPLEX DIGITAL "PL" BASE STATIONS.

THE FOLLOWING TABLE FOR FILTERING COMPONENT USAGE BY MODEL. MODEL TLN5646A DOES NOT USE ANY FILTERING COMPONENTS, BUT INCORPORATES "THRU" PLATING INSTEAD (PLATING RUNS AND FILTERING COMPONENTS DO NOT EXIST SIMULTANEOUSLY). SEE PARTS LIST FOR COMPONENT VALUES AND PART NUMBERS.

951 IS CONNECTED IN SINGLE-FREQUENCY RECEIVERS ONLY (RECEIVER CHANNEL ELEMENTS ALWAYS ACTIVATED).

OPTIONAL MODE OF RECEIVER OPERATION KNOWN AS "AND SQUELCH" CAN BE ADDED WHEN DESIRABLE. THIS FEATURE PROVIDES "VARIABLE PL SENSITIVITY" (PL-CODED SQUELCH PLUS ADJUSTABLE NOISE-ACTIVATED (CARRIER) SQUELCH). THIS MODE, THE RECEIVER AUDIO CHANNEL IS ACTIVATED WHEN A PL CODE IS RECEIVED AND THE CARRIER SQUELCH THRESHOLD LEVEL IS EXCEEDED. SINCE THE CARRIER NOISE-ACTIVATED SQUELCH CIRCUIT SENSITIVITY IS ADJUSTABLE, AND SINCE IT IS ONE OF THE CONTROLLING FACTORS IN THE SQUELCHING OF RECEIVER AUDIO, THE OPERATION CAN BE FULLY DESCRIBED AS "VARIABLE PL SENSITIVITY." THUS "AND SQUELCH" DENOTES BOTH PL-CODED SQUELCH AND CARRIER SQUELCH OPERATING SIMULTANEOUSLY. CIRCS 0966, 892 ARE USED AND JUMPER JUMPS AND JUMPS ARE OMITTED FOR "AND" SQUELCH OPERATION (JUMPS ON AUDIO AS SQUELCH BOARD MUST BE CUT) AND ARE NOT PART OF THE RECEIVER INTERCONNECT BOARD.

REPEATER STATIONS USE THE TLN5655A VERSION BOARD TO INTERCONNECT THE 2ND RCVR TO THE UNIFIED CHASSIS INTERCONNECT BOARD. THIS VERSION BOARD DOES NOT PLUG DIRECTLY INTO THE UNIFIED CHASSIS BOARD BUT RATHER IS INTERCONNECTED VIA REPEATER IS CONNECTED TO THE RCVR INTERCONNECT BOARD JAS DETAILED IN THE 2ND RCVR CONNECTION TABLE.

957 REMOVED ON TLN5655A FOR REPEAT OR DUPLEX OPERATION.

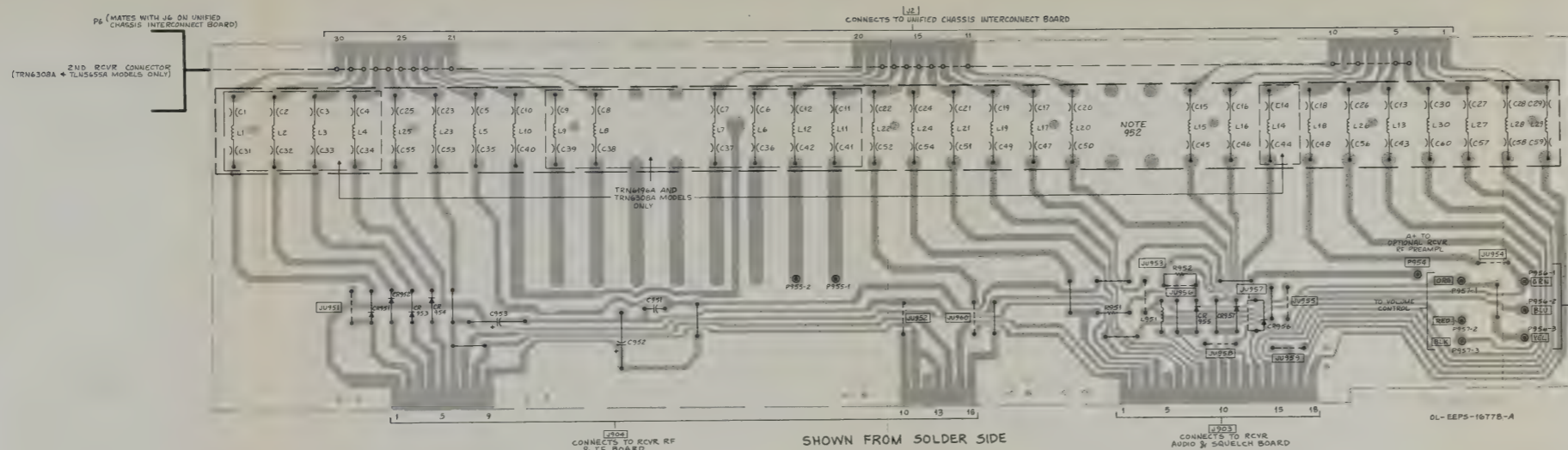
955 REMOVED FOR 1RB TEST OR DIGITAL PL CODE OPTION ON UNLINKED REPEATERS.

ON TRUNKED REPEATERS, J2-5 IS CONNECTED TO REC SITE DATA RATHER THAN TO KEYED A.

PARTS LIST SHOWN ON BACK
Motorola No. PEPS-28297-0
4/15/79-PHI

RECEIVER INTERCONNECT BOARD

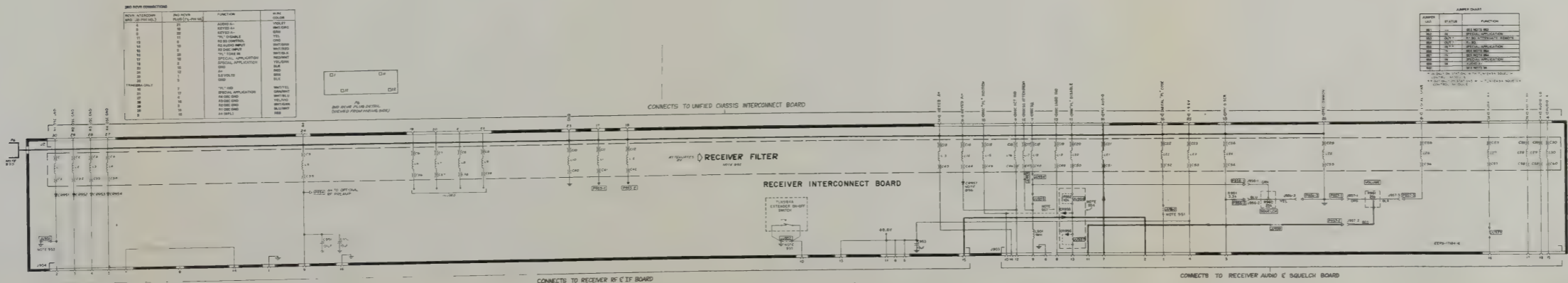
RECEIVER INTERCONNECT BOARD



FUNCTION

Interconnects various receiver circuit boards to the unified chassis interconnect board. Model differences are primarily rf filtering.

MODEL	APPLICATION
TLN5646A	With Repeater Stations
TLN5648A	With Base Stations (1st RCVR only)
TLN5655A	With Base Stations (2nd RCVR only)
TRN6196A (optional)	In place of TLN5646A or TLN5648A (provides additional filtering)
TRN6308A (optional)	In place of TLN5655A (provides additional filtering)



PARTS LIST SHOWN ON BACK
Motorola No. PEPS-28297-0
4/15/79-PHI

"MICOR" "SENSITRON" HIGH BAND RECEIVER RF & IF BOARD

TLD8270B SERIES

AND PROCEDURE

quipped with an op
nect and bypass th
receiver then, rec

nd L1 in that order
er indication. Re
mum quieting.

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TLD8271B	132-142
TLD8272B	142-150.8
TLD8273B	150.8-162
TLD8274B	162-174

AND PROCEDURE

ENT OUTPUT (3R
L108 and L109 for

On multi-frequer
adjustment with f
F1 position.

- Unsquench the r
h control fully cou
line" radios must
11.7 MHz (or 11.8
est set into L106 o
eing careful not to
sert probe into ho
meter 5 indicatio
d" into receiver).
reading on top sca
test set in positio
al and should be ex

onnect signal gene
apply a carrier fr
10 and L111 for

If two peaks are
s farthest from ci
er 5 indication ca
center conductor c

irectly to the mixe

R AND MIXER - T

ugs until tip of eac
prox. 1/4 inch bey

list code 8). Con

na input and apply

Tune L101 thru L

ition 5. Turn L10

one turn. Peak L

r, on meter positi

erator output as ne
n between 10 and 2

CHARACTERISTICS

	50 ohms
	132-174 MHz
FREQUENCY RANGE	15.455-18.055 MHz
	30 kHz
	1 (capable of up to 4 for special applications)
	-100 dB @±30 kHz
IA SINAD	-80 dB
RANGE EIA	±7 kHz
dB Quieting	less than 0.5 microvolt
IA Sinad	less than 0.35 microvolt
EL ELEMENT)	±.0005% (AFC optional) from -30°C to +60°C ambient
JECTION	-100 dB
TS	regulated 9.6 volts @ 70 mA 13.8 volts @ 20 mA
	fully solid-state, two integrated circuits
	FM superheterodyne single conversion
	11.7 MHz or 11.8 MHz
PE	dual resonator, mode coupled, monolithic crystal
	dual resonator, mode coupled, monolithic crystal
	three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set, optional built-in metering, or any 50 microampere meter.

HIGH BAND RECEIVER RF & IF BOARD

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REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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PARTS LIST

NOTE

This parts list covers five models of the Receiver Interconnect Board. Where differences exist, the model number of the applicable unit is given in the Description column.

TLN5646A/TLN5648A/TLN5655A/TRN6196A/TRN6308A
Receiver Interconnect Board PL-3435-B

C1 thru 60	21-861219	CAPACITOR, fixed: 1000 pF ±100-0%; 500 V (TRN6196A & TRN6308A)
C951	21-82428B59	.01 uF ±80-20%; 200 V
C952, 953	23-84762H09	15 uF ±20%; 20 V
CR951 thru 954, 957	23-84762H09	DIODE: (SEE NOTE) silicon
L1 thru 4, 6 thru 9, 11, 12, 14, 15 thru 21, 24, 25, 26 L5, 10, 13, 22, 23, 27 thru 30 L901	24-83961B01	COIL, r.f. 3 turns; coded brown
P6	--	CONNECTOR, plug: (TLN5655A) includes: HOUSING, connector CONTACT, receptacle: 14 req'd.
P6	--	(TRN6308A) includes: HOUSING, connector CONTACT, receptacle: 20 req'd.
R951	6-124C61	RESISTOR, fixed: 3, 3k ±10%; 1/4 W

NON-REFERENCED ITEMS

	7-82626K01 14-82621K01	BACKET, filter INSULATOR (TLN5648A & TLN5655)
	1-80775B75	COVER ASSEMBLY, filter (TLN5646A, TLN5655A, TRN6196A & TRN6308A) includes: COVER, filter
	15-82173K01 3-138162	SCREW, tapping: 4-40 x 3/8"; 5 used (TLN5646A, TRN6196A & TRN6308A)
	3-139495	SCREW, tapping: 6-20 x 5/16"; 4 used (TLN5646A, TLN5648A, TRN6196A & TRN6308A)
	42-84284B01	RETAINER, screw: 5 used (TLN5646A, TRN6196A & TRN6308A)
	3-139495	SCREW, tapping: 6-20 x 5/16"; 7 used (TLN5655A)
	42-82143C02	CLAMP, cable: 1/4" ID; 2 used (TLN5655A)
	42-82143C02	CLAMP, cable: 1/4" ID (TRN6308A)
	42-82143C03	CLAMP, cable: 1/8" ID (TLN5655A & TRN6308A)

NOTE:

For optimum performance, replacement diodes must be ordered by Motorola part number.

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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TLN5912A Hardware Kit, 2nd Rcvr PL-5080-O

R960	18-82515B50	RESISTOR, variable: 25k ±30%; 1/4 W
------	-------------	--

NOTE:

Hardware for TLN5912A is listed in the Receiver Hardware Kits Section.

TLN5184A "Extender" On-Off Switch Kit PL-5081-O

S1	40-82085J03	SWITCH, toggle: spdt
NON-REFERENCED ITEMS		
	4-1725	WASHER, flat .266 x .562 x .040; 2 used
	54-84861G01	LABEL: Extender On-Off

TLN5892A Chassis & Hardware Kit PL-5086-O

R951, 961	18-82515B50	RESISTOR, variable: 25k ±30%; 1/4 W (shown on Receiver Interconnect Board Schematic)
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NOTE:

Hardware for TLN5892A is listed in the Control and Application Manual.

TLN5060A Optional "And Squelch" Parts PL-2573-A

CR955 CR956	48-82192B03 48-82192B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon silicon
R952	6-129468	RESISTOR, fixed: 10k ±10%; 1/4 W

RECEIVER ALIGNMENT PROCEDURE

A. FREQUENCY CALCULATIONS

Where:

f_o = channel element frequency

f_c = carrier frequency

11.7 MHz IF Receivers 11.8 MHz IF Receivers

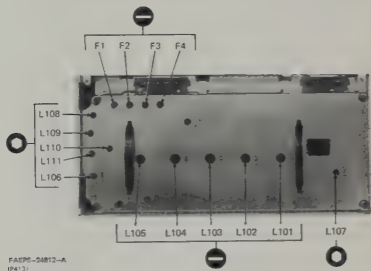
132-150.8 MHz

$$f_o = \frac{f_c + 11.7 \text{ MHz}}{9} \text{ or } \frac{f_c + 11.8 \text{ MHz}}{9}$$

150.8-174 MHz

$$f_o = \frac{f_c - 11.7 \text{ MHz}}{9} \text{ or } \frac{f_c - 11.8 \text{ MHz}}{9}$$

B. RECEIVER ADJUSTMENT LOCATIONS



C. TYPICAL RECEIVER METER READINGS (NO INPUT SIGNAL APPLIED)

TEST SET SELECTOR SWITCH POSITION	READING (uA)	CIRCUIT METERED
3	15	Channel Element Output
4	0 ±2	Discriminator Output
5	1 or less (if unreadable, inject maximum on-channel signal at antenna receptacle; 20 uA, typical, should be obtained).	3rd IF Amplifier and Limiter

D. RF PREAMPLIFIER ALIGNMENT

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
1				If the station is equipped with an optional pre-amplifier, disconnect and bypass the pre-amplifier. Align the receiver then, reconnect the preamplifier.
2	L3, L2, L1	5	METER REV.	Adjust L3, L2, and L1 in that order for maximum test set meter indication. Repeat.
3				Tune L2 for maximum quieting.

E. RECEIVER ALIGNMENT

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
1	L108, L109	3	METER REV.	CHANNEL ELEMENT OUTPUT (3RD HARMONIC) - Adjust L108 and L109 for maximum meter indication. On multi-frequency receivers make this adjustment with frequency selector switch in F1 position.
2	L107	4	A or B (Test Set must be equipped with 11.7 MHz crystal in corresponding socket) (and with an 11.8 MHz crystal in corresponding socket for some two-receiver stations).	DISCRIMINATOR - Unsquench the receiver by turning the squelch control fully counterclockwise. "Private-Line" radios must also be PL disabled. Insert 11.7 MHz (or 11.8 MHz) injection probe of test set into L106 opening of receiver shield being careful not to contact circuit board. Insert probe into hole far enough to obtain a meter 5 indication of 15 uA (signal is "sprayed" into receiver). Adjust L107 for 0 center reading on top scale with selector switch of test set in position 4. Adjustment is critical and should be exactly on 0. Remove probe.
3	L110, L111	5	METER REV.	MULTIPLIER - Connect signal generator to antenna input and apply a carrier frequency signal. Adjust L110 and L111 for maximum meter indication. If two peaks are observed, use peak with slugs farthest from circuit board. If a meter 5 indication cannot be obtained, connect center conductor of signal generator cable directly to the mixer gate.
4	L101, L102, L103, L104, L105, L106	5	METER REV.	RF PRESELECTOR AND MIXER - Turn out L101 thru L105 slugs until tip of each tuning screw extends approx. 1/4 inch beyond spring (mechanical parts list code 8). Connect signal generator to antenna input and apply carrier frequency signal. Tune L101 thru L105 for peak on meter position 5. Turn L103, L104, and L105 slugs in one turn. Peak L106 thru L101, in that order, on meter position 5. Decrease signal generator output as necessary to maintain indication between 10 and 25 uA.

F. RECEIVER ALIGNMENT (Cont'd)

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
5	L108, L110, L111	5	METER REV.	Adjust signal generator output for 25 uA meter indication. Detune L108 until meter indication decreases to 15 uA. Repeak L110 and L111 for maximum meter indication. Repeat entire step.
6	L108, L109	3	METER REV.	Repeak L108 and L109 for maximum meter indication.
7	L101, L102, L103, L104, L105	5 6*	METER REV. OFF	Repeak L101 through L105 for maximum meter indication. Repeat. Peak L103 thru L105 for minimum indication on meter 6 (maximum quieting).
8	F1, F2, F3, F4	5 4	METER REV.	ON-FREQUENCY ADJUSTMENT - Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, test set meter position 5 should indicate rise when transmitter is keyed (if necessary connect antenna). Check test set position 4 reading with transmitter keyed. 0 indicates on-frequency condition. Adjust F1 warp capacitor for exact 0 reading. DO NOT READJUST L108 OR L109 AFTER THESE ADJUSTMENTS ARE MADE. If the receiver is equipped with AFC, short the AFC DISABLE contact while adjusting F1.
9	-	-	-	Perform 20 dB quieting sensitivity measurement as check of alignment.

* If the portable test set is used, connect an ac voltmeter across pins 1 and 18 of the audio control module for this reading.

"MICOR" "SENSITRON" HIGH BAND RECEIVER RF & IF BOARD

TLD8270B SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TLD8271B	132-142
TLD8272B	142-150.8
TLD8273B	150.8-162
TLD8274B	162-174

TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE	50 ohms
RF FREQUENCY RANGE	132-174 MHz
CHANNEL ELEMENT FREQUENCY RANGE	15.455-18.055 MHz
CHANNEL SPACING	30 kHz
NUMBER OF CHANNELS	1 (capable of up to 4 for special applications)
SELECTIVITY EIA SINAD	-100 dB @ ±30 kHz
INTERMODULATION EIA SINAD	-80 dB
MODULATION ACCEPTANCE EIA	±7 kHz
SENSITIVITY (50 OHMS RF INPUT IMPEDANCE)	20 dB Quieting EIA Sinad
	less than 0.5 microvolt less than 0.35 microvolt
OSCILLATOR (CHANNEL ELEMENT) STABILITY	±.0005% (AFC optional) from -30°C to +60°C ambient
SPURIOUS & IMAGE REJECTION	-100 dB
POWER REQUIREMENTS	regulated 9.6 volts @ 70 mA 13.8 volts @ 20 mA
CONSTRUCTION	fully solid-state, two integrated circuits
RECEIVER TYPE	FM superheterodyne single conversion
IF FREQUENCY	11.7 MHz or 11.8 MHz
CRYSTAL FILTER TYPE	dual resonator, mode coupled, monolithic crystal
DISCRIMINATOR TYPE	dual resonator, mode coupled, monolithic crystal
METERING	three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set, optional built-in metering, or any 50 microampere meter.

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the adapter cable SENS switch to position. If the adapter cable has no unit operates at 100 mV all of

the adapter cable reference switch position B.

to the meter reading table in para-
st the test set selector switch to
lled for in the table and observe
er. Notice that the meter read-
e table are minimums.

st an ac voltmeter across pins 1
dio control module.

ceivers only). Disable PL, using
e PL module.

receiver squelch control fully
e (unsquelched).

the LINE LEVEL control so the
ads 565 mV volts ac.

signal generator controls as fol-

up the signal generator to produce
ulated signal.

the generator output level to max-

the signal generator output fre-
selected channel receive frequency.
ul generator on frequency without
nter, adjust the generator frequen-
test set meter position 4 reads

decrease the signal generator
l the ac voltmeter reads 565 mV ac
n 565 mV ac). Switch to a lower
if necessary. The generator
ates the 20 dB quieting sensitivity
.5 microvolt, or less (0.25 micro-
mplifier).

just the LINE LEVEL control as
e MAINTENANCE section of the

the Optional Built-In Receiver ing

squelch the receiver by turning the
ELCH control fully counterclock-
e-Line" receivers must also be
urn metering POWER switch on.

3.2.2.2 Set the meter selector switch to posi-
tion 6 and the speaker switch to the OFF
position. Adjust the receiver LINE LEVEL con-
trol for 50 uA as indicated on the meter.

3.2.2.3 Connect a signal generator to the sta-
tion antenna receptacle and adjust it to
the receiver frequency. Set the rf output to min-
imum.

3.2.2.4 Increase the signal generator output
until the meter reading drops to 5 uA.
The generator output level now indicates the
20 dB quieting sensitivity and should be 0.5 micro-
volt, or less (0.25 microvolt, or less, with
preamplifier). Readjust the line level as described
in the MAINTENANCE section in the front of the
manual.

3.3 TROUBLESHOOTING

3.3.1 Circuit Measurements

3.3.1.1 General

A failure in almost any part of the rf
and i-f section will produce an improper meter
reading on one or more of the test points.
Improper alignment will also cause improper
meter readings.

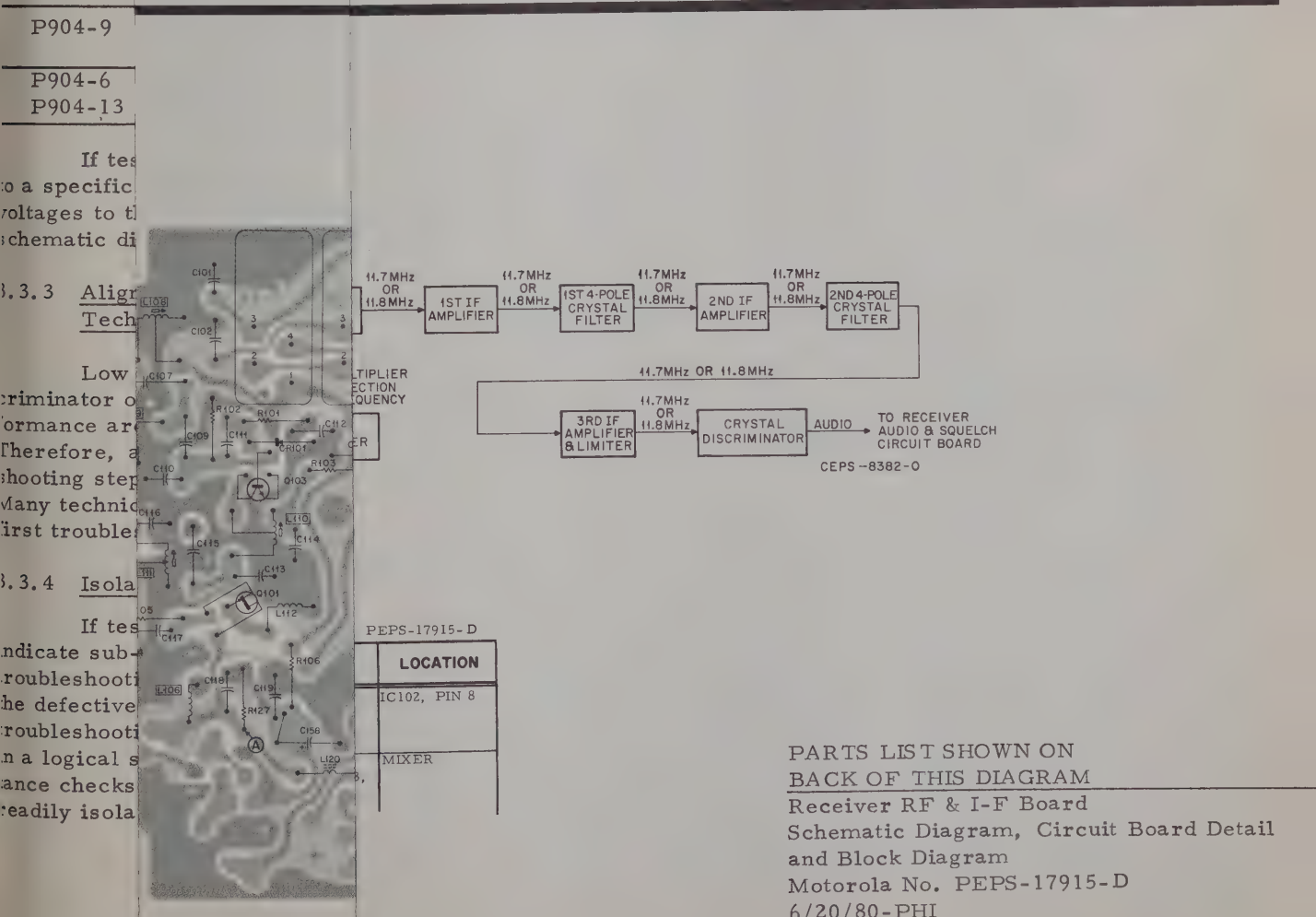
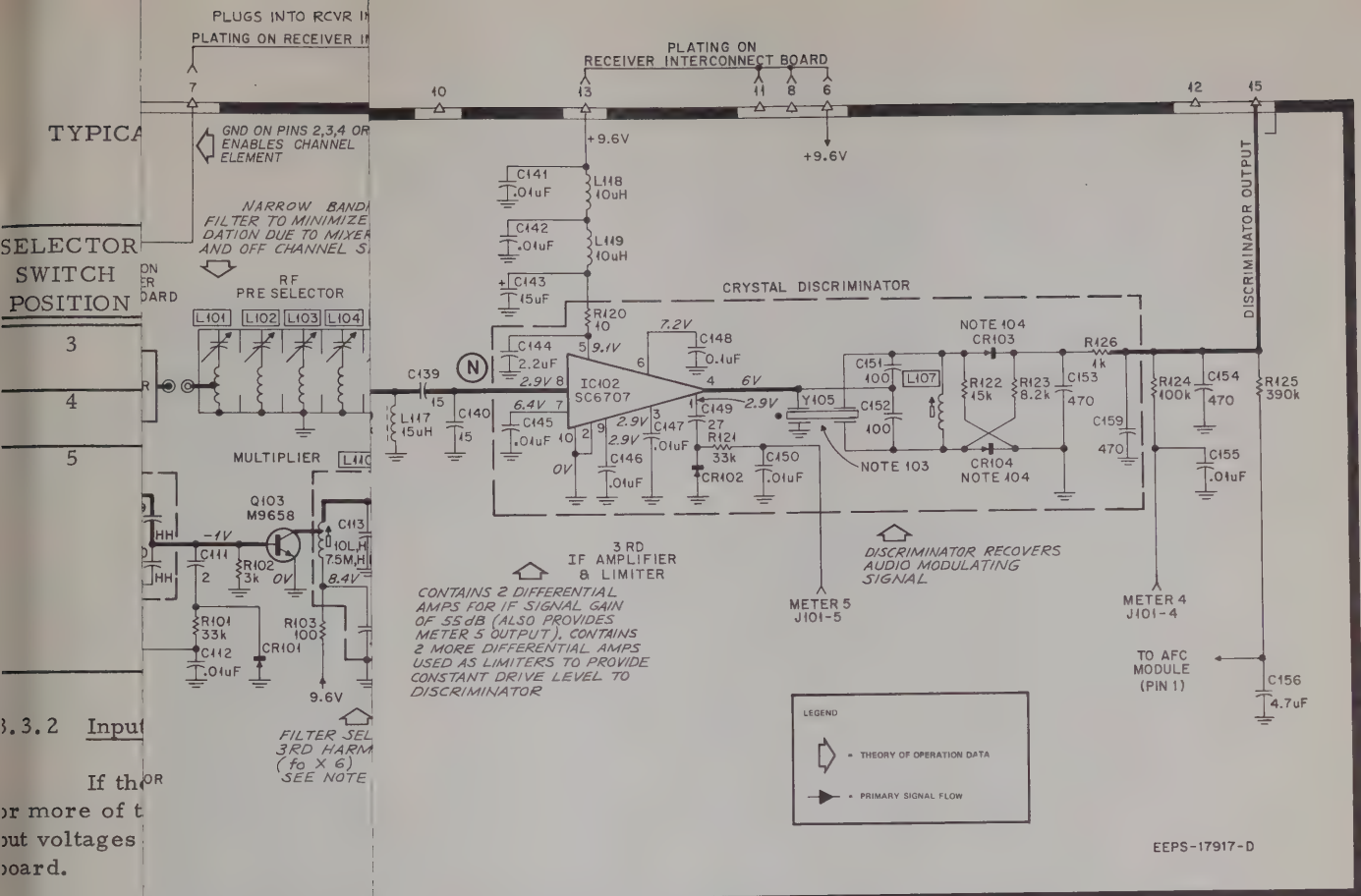
A "0" meter reading in position 3 or 5
indicates either (1) insufficient drive from a pre-
ceding stage or (2) a defective component at the
metering point.

3.3.1.2 Procedure Using Portable Test Set or Optional Built-In Receiver Metering

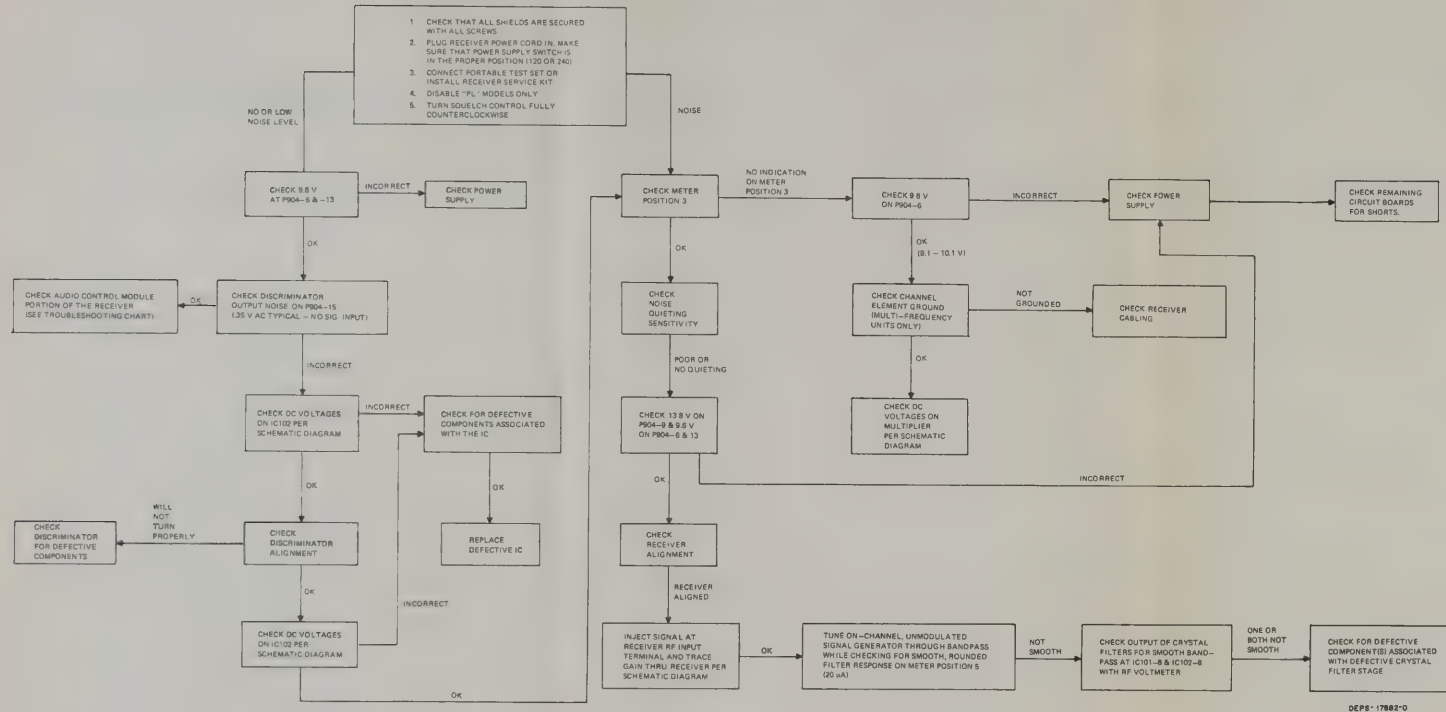
3.3.1.2.1 (Portable test set only). Connect the
20-pin plug of the adapter cable to
the test set. When the test set is not in use, dis-
connect the 20-pin plug to conserve test set
battery life. The plug acts as an on-off switch
completing the battery circuit.

3.3.1.2.2 (Portable test set only). Connect the
white "metering" plug of the adapter
cable to the metering receptacle on the receiver
rf and i-f circuit board.

3.3.1.2.3 Compare the current readings in
SELECTOR SWITCH positions 3, 4
and 5 with those in the following table. A low
reading on meter position 3 indicates a defective
channel element or multiplier circuit. An im-
proper meter reading in position 4 or 5 readings in-
dicate a malfunction elsewhere in the receiver,
which can most rapidly be found by checking rf and
i-f voltages, per the schematic diagram.



RECEIVER RF & IF CIRCUIT BOARD TROUBLESHOOTING CHART



1. DESCRIPTION

1.1 The fully solid-state receiver rf & i-f circuit board consists of an rf preselector, two integrated circuits, three transistors, two i-f crystal filters, plug-in channel elements, and a crystal discriminator. These components are used to develop a low-noise audio signal from a frequency modulated "on-channel" rf carrier in the 132-174 MHz range.

1.2 All circuits are constructed on a single plug-in circuit board which is easily removed and replaced. All external dc and audio connections are made at a single row of pins which eliminate interconnecting wires; rf input is provided by a single plug-in coaxial cable. Circuit board plating is on both sides of the board with all components mounted on the back side. All alignment points are accessible from the front of the station.

2. FUNCTIONAL OPERATION

This circuit board is a highly selective, crystal controlled, single conversion FM receiver (less audio amplifier, squelch circuitry, and speaker). Bandwidth and selectivity characteristics are determined by rf preselector coils and i-f crystal filters. Plug-in crystal oscillator modules (channel elements) provide stable frequency control. Integrated circuits are used for all amplification and limiting after the first crystal filter section which produce high i-f signal gain and exceptionally high reliability. A crystal discriminator is used to provide high audio recovery from the i-f signal. Refer to schematic diagram for more circuit details.

3. MAINTENANCE

3.1 GENERAL

This section of the manual provides the maintenance procedures for the receiver rf and i-f section of the receiver. These bench tests include metering measurements and procedures for testing and troubleshooting, including integrated circuit check-out.

NOTE

The receiver rf and i-f board must be installed in the receiver for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation

NOTE (Cont'd)

and testing to provide a good rf ground to all stages of the receiver. The board may be installed in the station or a "Micor" mobile radio set for testing.

3.2 20 DB QUIETING SENSITIVITY TEST

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service.

It may be performed using a Motorola S-1056B thru S-1059B Portable Test Set or optional built-in receiver metering. J101 can accommodate only the built-in metering set or the portable test set, but not both simultaneously. Plugging a portable test set in a receiver that has built-in metering will disconnect the built-in metering cable.

NOTE

The receiver shield must be in place while performing this test.

3.2.1 Using the Portable Test Set and an AC Voltmeter

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver.

Step 4. Using a TEK-37A Adapter Cable, connect a Motorola portable test set or meter panel to the station as follows:

--Connect the adapter cable 20-pin connector to the receptacle on the front of the test set or meter panel.

--Connect the adapter cable 7-pin white "metering" plug to the metering receptacle on the receiver rf and i-f board.

Step 5. Set the portable test set switches as follows:

--Set the function switch to the RCVR position.

--Set the meter reversing switch to the OFF position.

--Set the adapter cable SENS switch to the 100 mV position. If the adapter cable has no SENS switch, the unit operates at 100 mV all of the time.

--Set the adapter cable reference switch to position A or position B.

Step 6. Refer to the meter reading table in paragraph 3.3.1. Set the test set selector switch to the positions called for in the table and observe the test set meter. Notice that the meter readings given in the table are minimums.

Step 7. Connect an ac voltmeter across pins 1 and 18 of the audio control module.

Step 8. (PL receivers only). Disable PL, using the switch on the PL module.

Step 9. Set the receiver squelch control fully counterclockwise (unsquelched).

Step 10. Adjust the LINE LEVEL control so the ac voltmeter reads 565 mV volts ac.

Step 11. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until test set meter position 4 reads exactly zero.

Step 12. Slowly decrease the signal generator output level until the ac voltmeter reads 565 mV ac (20 dB down from 565 mV ac). Switch to a lower voltmeter scale if necessary. The generator output now indicates the 20 dB quieting sensitivity and should be 0.5 microvolt, or less (0.25 microvolt with preamplifier).

Step 13. Readjust the LINE LEVEL control as described in the MAINTENANCE section of the manual.

3.2.2 Using the Optional Built-In Receiver Metering

3.2.2.1 Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" receivers must also be PL disabled. Turn metering POWER switch on.

3.2.2.2 Set the meter selector switch to position 6 and the speaker switch to the OFF position. Adjust the receiver LINE LEVEL control for 50 uA as indicated on the meter.

3.2.2.3 Connect a signal generator to the station antenna receptacle and adjust it to the receiver frequency. Set the rf output to minimum.

3.2.2.4 Increase the signal generator output until the meter reading drops to 5 uA. The generator output level now indicates the 20 dB quieting sensitivity and should be 0.5 microvolt, or less (0.25 microvolt, or less, with preamplifier). Readjust the line level as described in the MAINTENANCE section in the front of the manual.

3.3 TROUBLESHOOTING

3.3.1 Circuit Measurements

3.3.1.1 General

A failure in almost any part of the rf and i-f section will produce an improper meter reading on one or more of the test points. Improper alignment will also cause improper meter readings.

A "0" meter reading in position 3 or 5 indicates either (1) insufficient drive from a preceding stage or (2) a defective component at the metering point.

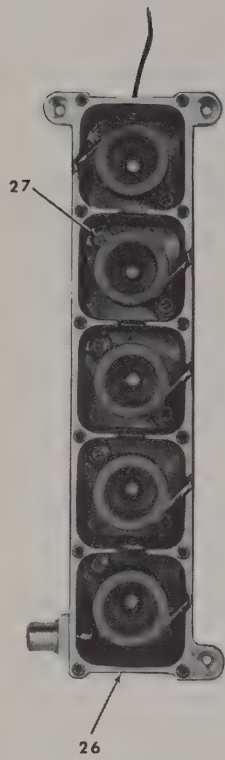
3.3.1.2 Procedure Using Portable Test Set or Optional Built-In Receiver Metering

3.3.1.2.1 (Portable test set only). Connect the 20-pin plug of the adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve test set battery life. The plug acts as an on-off switch completing the battery circuit.

3.3.1.2.2 (Portable test set only). Connect the white "metering" plug of the adapter cable to the metering receptacle on the receiver rf and i-f circuit board.

3.3.1.2.3 Compare the current readings in SELECTOR SWITCH positions 3, 4 and 5 with those in the following table. A low reading on meter position 3 indicates a defective channel element or multiplier circuit. An improper meter reading in position 4 or 5 readings indicate a malfunction elsewhere in the receiver, which can most rapidly be found by checking rf and i-f voltages, per the schematic diagram.

CEPS-6142-D
00-025, S-3000-K-25,
0-1-25, S-3000-G-46)





MOTOROLA INC.

**Communications
Group**

“MICOR” “SENSITRON” RECEIVER AUDIO & SQUELCH BOARD

MODEL TRN6006A, 7A

1. DESCRIPTION

The audio and squelch board performs two basic functions -- audio amplification and audio squelching. The first two stages in the audio circuitry amplify the signal from the discriminator and provide the proper frequency response. This signal is routed to the line driver module in remote control stations and to the local logic board in local control models. The audio returns through a VOLUME control. The remaining stages in the audio circuitry take the signal returning from the line driver and VOLUME control and provide the necessary frequency response at the speaker. These latter stages also provide the drive required by the final audio amplifiers (located on a separate board) for rated power output. An integrated circuit and one transistor perform all of these functions.

The squelch circuitry disables the audio path during intervals between received messages. One integrated circuit performs the necessary detection and squelching functions. Also, in conjunction with the PL decoder and filter board in a PL station, this integrated circuit provides unsquelching when PL signals are received.

2. FUNCTIONAL OPERATION

2.1 GENERAL

The audio signal from the receiver discriminator is routed to the emitter follower (refer to Figure 1). The emitter follower output is coupled to the SQUELCH control mounted on the receiver chassis or local front panel and also to the line level potentiometer mounted on the audio & squelch board. The signal from this control is next applied to the preamplifier. If JU201 is cut, the signal is first sent through the PL filter for attenuation of the PL tone. The preamplifier output is coupled off the board to the line driver or local logic board. Audio returning from the line driver or local logic board is coupled through the appropriate VOLUME control to

amplifier Q203. After amplification, the signal is applied to the audio amplification circuits. Here, the signal is raised to a level sufficient to drive the audio power amplifiers. These are mounted on a separate board which is secured to the chassis to provide “heat-sinking” capability. The output of the audio power amplifiers is applied to an output transformer which drives a speaker or speaker desk set transformer (local control stations only).

The signal returned from the SQUELCH control is applied to the squelch section for noise squelch control. Squelch action is achieved by utilizing the inherent characteristics of a discriminator known as “noise quieting”. An input signal will cause more quieting of noise as the signal level is increased. When a desired level of noise quieting is reached, as determined by the squelch circuitry and the setting of the SQUELCH control, the audio portion of the board and line driver are enabled to allow a message to be heard. In a remote control station, the squelch circuit disables the audio circuitry by shunting a point in the audio signal path to ground and also operating a series switch in the audio signal path of the line driver.

In a local control station, the series path is broken on the local logic board. In addition, an *extra* shunt switch is activated on this board and its low resistance is directed back to the audio amplification circuits. This provides extremely quiet operation during periods of no signal.

Upon completion of a received message, audio shut-off is either immediate or automatically delayed 150 milliseconds, depending upon the signal level of the previously received rf carrier. A strong signal produces the immediate shut-off and prevents an annoying, loud “squelch tail” burst from being heard. Weak signals (signals that produce less than 20 dB noise quieting) produce the long shut-off delay and prevent a message from being chopped under “flutter” conditions. Since the

AUDIO & SQUELCH BOARD

technical writing services

1301 E. Algonquin Road, Schaumburg, IL 60196

ELECTRICAL PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA

PART NUMBERS WHEN ORDERING

REPLACEMENT PARTS

LEGEND

: 132-142 MHz

M = 142-150.8 MHz

H = 150.8-162 MHz

HH = 162-174 MHz

1LD2271B Receiver Board & RF Deck (132-142 MHz)

1LD2272B Receiver Board & RF Deck (142-150.8 MHz)

1LD2273B Receiver Board & RF Deck (150.8-162 MHz)

1LD2274B Receiver Board & RF Deck (162-174 MHz)

PL-3171-F

CAPACITOR, fixed: pF ±5%

500 V; unl stated

.01 uF ±50-20%; 200 V

0.75

21D8242B55

21D8245B00

30; 200 V; NPO

21D8246B00

7; NPO

21D8247B00

5; 200 V; NPO

21D8248B00

7; NPO

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

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21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

21-8340B44

7; N150

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR101	48C82139G01	diode;
CR102	48C82139G01	germanium
CR103	48D8416A01	germanium
CR104	48D8416A01	planar hot carrier
CR105	48C84616A01	planar hot carrier
		INTTEGRATED CIRCUIT:
	51-84561L69	type, M6169
	51-84561L69	type, M6169
		CONNECTOR, receptacle:
J101	9C4207B01	female; 7 contact
J102	9C41135B01	female; single contact; phono type
		COIL, RF; unl stated
L101L	24D84070C01	input
L101M	24D84070C01	input
L101H	24D84409B01	input
L101HH	24D84409B01	input
L102L	24D84070C03	center
L102M	24D84070C03	center
L102H	24D8409B03	center
L102HH	24D8409B03	center
L103L	24D84070C03	center
L103M	24D84070C03	center
L103H	24D84409B03	center
L103HH	24D84409B03	center
L104L	24D84070C03	center
L104M	24D84070C03	center
L104H	24D84409B03	center
L104HH	24D84409B03	center
L105L	1V80713B52	output
L105M	1V80713B52	output
L105H	1V80709B36	output
L105HH	1V80709B36	output
L106	24C83879G08	IF (ORN)
L107	24-83879G04	discriminator (YEL)
L108	24D84115B01	multiplier (RED)
L109	24D84115B01	multiplier (BRN)
L110	24D83879G07	multiplier (YEL)
L111	24D83879G08	multiplier (VIO)
L112L	24C8411B02	choke; YEL
L112M	24C8411B02	choke; YEL
L112H	24C8411B02	choke; YEL
L112HH	24C8411B01	choke; WHT
L113	24D82450D24	choke; 10 uH (shielded)
L114	24D82540D24	choke; 15 uH (shielded)
L115	24D82723H07	choke; 10 uH (VIO)
L116	24D82723H06	choke; 6.2 uH (BLU)
L117	24D82540D24	choke; 15 uH (shielded)
L118	24D82723H07	choke; 10 uH (VIO)
L119	24D82723H07	choke; 10 uH (VIO)
L120	76B8396B01	choke; Ferrite Bead
		TRANSISTOR: (SEE NOTE)
Q101	48R869943	N-Channel; FET M9943
Q102	48R869652	N-Channel; FET M9652
Q103	48R869658	N-P-N; M9658
		RESISTOR, fixed: ±10%; 1/4 W;
		unl. stated
R101	65127807	33K
R102	65124A60	3K ±5%
R103	65129753	100
R104	65127801	470
R105	65128699	2.2K
R106	65129753	100
R107L	65129145	82K
R107M	65129145	82K
R107H	65129230	12K
R107HH	65129230	12K
R108	65129752	270
R109	65127800	220
R110	65129686	27K ±5%
R111	65129667	22K ±5%
R112	65129779	560 ±5%
R113	65129667	22K ±5%
R114	65129887	12K ±5%
R115	65129236	15K ±5%
R116	65129667	22K ±5%
R117	65129779	560 ±5%
R118	65129667	22K ±5%
R119	6-124A65	4.7K
R120	65129755	10
R121	65127807	33K

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R122L, 122M	6-124A73	10K ±5%
R122H, 122HH	6-124A77	15K ±5%
R123L, 123M	6-129236	15K ±5%
R123H, 123HH	65129983	8.2K ±5%
R124	65129226	100K
R125	65128682	390K
R126	65127805	1K
R127	65129225	10K
		CRYSTAL, quartz
Y101	48D84412B01	11,700 kHz
Y102 thru 104	48D84412B03	11,700 kHz
Y105	48D84659B01	11,700 kHz

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLD8740A Shifted IF Crystal Kit	PL-2384-O	
		CRYSTAL UNIT, quartz:
Y101 thru 104	48-84412B02	11.8 MHz
Y105	48-84659B02	11-filter
		discriminator filter

MECHANICAL PARTS LIST

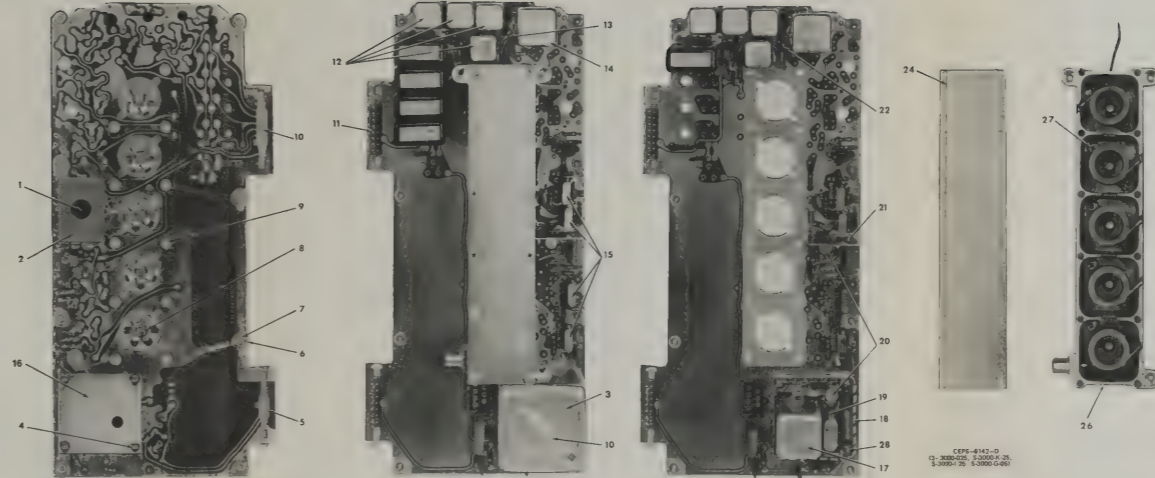
TLD8270B Series Receiver RF & IF Board PL-3170-B

CODE	MOTOROLA PART NO.	DESCRIPTION
1	58B4644B01	GROMMET, rubber
2	26C84642B01	SHIELD (IF)
3	26B94413B01	SHIELD, (discriminator)
4	35138398	SCREW, tapping: 4-24 x 1/2" (4 req'd)
5	55B84300B01	HANDLE (short)
6	42C84284B01	RETAINER, screw: 9 req'd
7	35136905	LOCKSCREW: No. 4 x 5/16"; 9 req'd
8	41B84410B03	NUT, screw tensioning: 5 req'd.
9	24D82450D25	NUT, screw tensioning: 5 req'd.
	35135084	LOCKSCREW: No. 4 x 5/16"; 12 req'd.
10	55B84300B01	HANDLE (long); 2 req'd
11	25C84028B01	CONTACT, male; 16 req'd
12	26B84250B05	SHIELD, 4 req'd
13	39S10184A24	CONTACT, female
14	26B84250B06	SHIELD
15	14B84540B01	INSULATOR (crystal) 4 req'd
16	26B84414B01	SHIELD, bottom
17	26B84250B08	SHIELD
18	26C84115B01	SHIELD, spring
19	14A84583B01	INSULATOR (crystal)
20	4A49854	WASHER, spacer: 2 req'd
21	26B84643B01	SHIELD, barrier
22	39S10184A30	CONTACT
23	29K855943	CONTACT, male; 20 req'd
24	15D84408B01	COVER, RF deck
25	35134169	LOCKSCREW: No. 4 x 1/4" 12 req'd
26	15D84407B01	HOUSING, RF deck
27	35136926	LOCKSCREW: No. 4-40x5/16" 10 req'd.
28	58B4220B01	GROMMET, "Nylon"; 4 req'd

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

Channel Element	PL-2904-O
X1005A	Receiver control; 132-174 MHz

CEPS-8142-O
12-2880-100
1-2000/10 5-3000 G-080



MOTOROLA INC.

**Communications
Group**

“MICOR” “SENSITRON” RECEIVER AUDIO & SQUELCH BOARD

MODEL TRN6006A, 7A

1. DESCRIPTION

The audio and squelch board performs two basic functions -- audio amplification and audio squelching. The first two stages in the audio circuitry amplify the signal from the discriminator and provide the proper frequency response. This signal is routed to the line driver module in remote control stations and to the local logic board in local control models. The audio returns through a VOLUME control. The remaining stages in the audio circuitry take the signal returning from the line driver and VOLUME control and provide the necessary frequency response at the speaker. These latter stages also provide the drive required by the final audio amplifiers (located on a separate board) for rated power output. An integrated circuit and one transistor perform all of these functions.

The squelch circuitry disables the audio path during intervals between received messages. One integrated circuit performs the necessary detection and squelching functions. Also, in conjunction with the PL decoder and filter board in a PL station, this integrated circuit provides unsquelching when PL signals are received.

2. FUNCTIONAL OPERATION

2.1 GENERAL

The audio signal from the receiver discriminator is routed to the emitter follower (refer to Figure 1). The emitter follower output is coupled to the SQUELCH control mounted on the receiver chassis or local front panel and also to the line level potentiometer mounted on the audio & squelch board. The signal from this control is next applied to the preamplifier. If JU201 is cut, the signal is first sent through the PL filter for attenuation of the PL tone. The preamplifier output is coupled off the board to the line driver or local logic board. Audio returning from the line driver or local logic board is coupled through the appropriate VOLUME control to

amplifier Q203. After amplification, the signal is applied to the audio amplification circuits. Here, the signal is raised to a level sufficient to drive the audio power amplifiers. These are mounted on a separate board which is secured to the chassis to provide “heat-sinking” capability. The output of the audio power amplifiers is applied to an output transformer which drives a speaker or speaker desk set transformer (local control stations only).

The signal returned from the SQUELCH control is applied to the squelch section for noise squelch control. Squelch action is achieved by utilizing the inherent characteristics of a discriminator known as “noise quieting”. An input signal will cause more quieting of noise as the signal level is increased. When a desired level of noise quieting is reached, as determined by the squelch circuitry and the setting of the SQUELCH control, the audio portion of the board and line driver are enabled to allow a message to be heard. In a remote control station, the squelch circuit disables the audio circuitry by shunting a point in the audio signal path to ground and also operating a series switch in the audio signal path of the line driver.

In a local control station, the series path is broken on the local logic board. In addition, an *extra* shunt switch is activated on this board and its low resistance is directed back to the audio amplification circuits. This provides extremely quiet operation during periods of no signal.

Upon completion of a received message, audio shut-off is either immediate or automatically delayed 150 milliseconds, depending upon the signal level of the previously received rf carrier. A strong signal produces the immediate shut-off and prevents an annoying, loud “squelch tail” burst from being heard. Weak signals (signals that produce less than 20 dB noise quieting) produce the long shut-off delay and prevent a message from being chopped under “flutter” conditions. Since the

AUDIO & SQUELCH BOARD

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68P81025E79-G

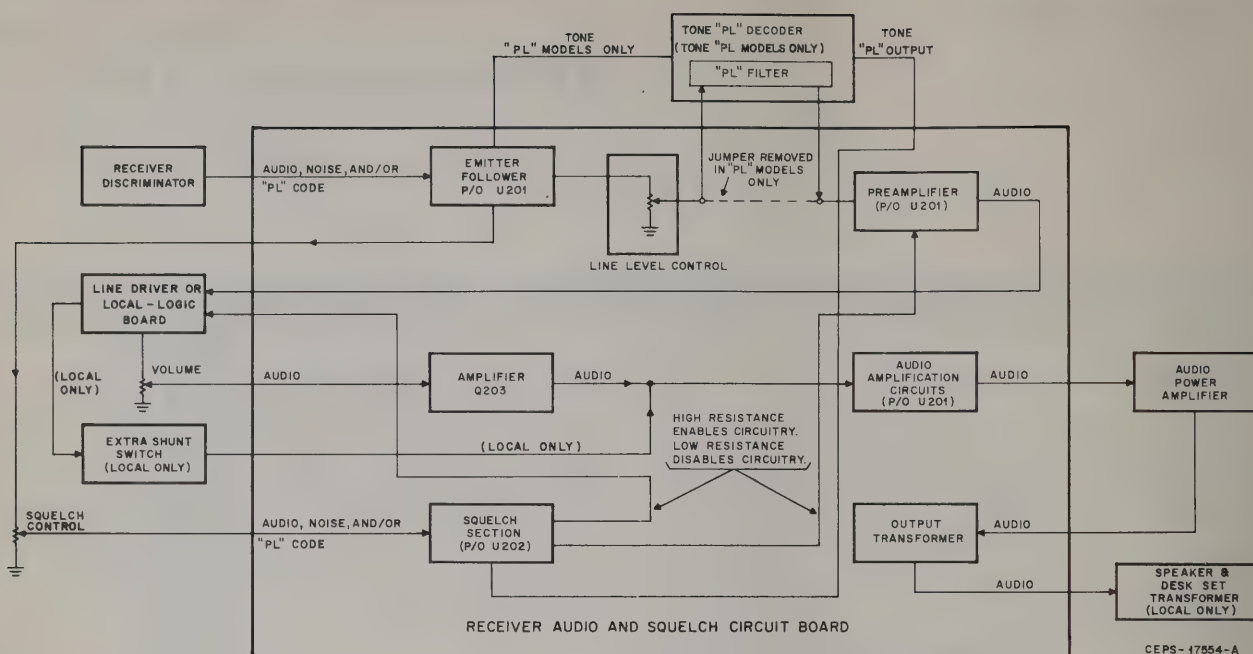


Figure 1. Audio and Squelch Block Diagram

received signal level must be low for the long turn-off delay to occur and the "squelch tail" level is comparable to that of the received signal, the "squelch tail" is not annoying.

2.2 EMITTER FOLLOWER CIRCUIT

The emitter follower circuit provides a low impedance output which isolates the high impedance discriminator output from the following squelch and audio circuitry.

The output of the discriminator is capacitively coupled to the emitter follower input at U201-1 and may consist of noise and audio signals. The output of the emitter follower at U201-2 is routed through C207 to the SQUELCH control and also to the line level control.

2.3 PREAMPLIFIER CIRCUIT

This circuit amplifies the low-level audio signal to provide the drive necessary for proper line driver operation. In addition, a negative feedback network (C208 and C209) provides the necessary frequency response characteristics for phone line operation. In PL stations, jumper JU202 is cut and the negative feedback is provided by C209 only. The network of R210 and C210 provides additional frequency response shaping.

2.4 AMPLIFIER CIRCUIT

Transistor Q203 increases the signal level from the line driver or local logic board to the level required by

the audio amplification circuits. Jumper JU203 is out when the equipment leaves the factory. The gain of Q203 is sufficient to drive the audio amplification circuits if the signal strength from the line driver or squelch gate exceeds -10 dBm. With a signal strength below this level, it is advisable to put in JU203 which increases the gain of Q203. The RC network at the input to this stage provides additional frequency response shaping required at the speaker.

2.5 AUDIO AMPLIFICATION CIRCUIT

The signal from amplifier Q203 is applied to the differential amplifier through capacitors C211 and C213. In a local station, the extra shunt switch on the local logic board is connected to the junction of C211 and C213.

The differential amplifier output provides the drive for the complementary amplifier. Resistors R221 and R220 form a voltage divider, biasing the differential amplifier at one-half of the supply voltage. Undesirable transient voltages are eliminated by capacitor C212.

Final audio amplification, on the audio and squelch board, occurs in the complementary amplifier. These stages provide the drive for the audio power amplifiers which are mounted on a separate board. The complementary amplifier emitter resistors (R218 and R219) are not included in U201 because of their high heat dissipation requirements.

Audio returned to the audio and squelch board (from the audio power amplifiers) is applied to the output transformer primary windings. This transformer consists of four windings -- two input primaries, an output secondary, and a feedback secondary. The output secondary winding couples audio power to an external 8-ohm speaker which can be driven with up to 10 watts at less than 5% distortion. Negative feedback from the output transformer winding through C216 and across R211 gives 6 dB per octave de-emphasis (roll-off) to the audio which has been pre-emphasized 6 dB per octave in the transmitter. Below 300 Hz, feedback from R213 and across C215 increases, giving low frequency de-emphasis. Capacitor C238 rolls off the high frequency gain of the amplifier to prevent high frequency oscillation. Capacitors C223 and C224, C240, C241, and C242 are rf bypass capacitors that shunt stray rf on the audio A+ and audio A- lines to ground. In local operation, the output secondary winding couples audio power to a 16-ohm speaker and an autotransformer. This transformer will drive up to six local desk sets.

2.6 NOISE ACTIVATED SQUELCH CIRCUIT

2.6.1 Squelch Input Circuit

The input signal from the SQUELCH control may consist of audio and noise. An input shaping network precedes U202 and passes high frequencies while attenuating low frequencies. Allowing the high frequencies to pass eliminates the effect of voice and results in more sensitive threshold squelch action.

The first amplifier and limiter is driven into limit by its input signal and prevents audio from squelching (disabling) the audio channel on voice signals. Amplified, limited noise is then passed through a coupling network to the second amplifier. This coupling network is also a high pass filter which further attenuates voice and tone signals to the second amplifier.

The second amplifier amplifies the noise signal and applies it through an RC coupling network to the detector. Capacitor C233 and C234 form another high pass filter that further attenuates the low frequencies. Capacitor C234 is used to produce a peak-to-peak detector action from the noise detector, and thus, generate twice the output voltage of a peak detector. This capacitor does not affect frequency response.

2.6.2 Detector and Switching Circuits

The detector output level is a function of received signal strength and the setting of the SQUELCH control. The detector develops the dc output voltage across filter capacitor C235. The lowest dc output voltage corresponds to a no signal input (maximum noise) condition. The output voltage increases as the received rf carrier signal level increases (noise decreases).

The primary function of the detector output, however, is the control of shunt switching. This is done by applying the detector output to three squelch control circuits simultaneously:

- long "squelch tail" circuit,
- long "squelch tail" defeat switch,
- carrier squelch switching logic.

With no received rf carrier signal (maximum noise condition), the long "squelch tail" circuit and long "squelch tail" defeat switch are off and the carrier squelch switching logic is on. The audio channel is subsequently disabled, unless the squelch control logic is overridden by other circuitry.

As the input signal level increases (noise decreases), the detector output voltage increases. A detector output voltage above 2.8 volts dc results in enabling of the long "squelch tail" circuit. The long "squelch tail" circuit produces a voltage at U202-12 of 5.5 volts dc; this voltage causes the carrier squelch switching logic circuit to turn off and thereby enabling the audio channel. Capacitor C236 and resistor R235 provide a rapid-rise, slow-decay time constant to the voltage applied to the carrier squelch switching logic circuit. This permits a weak signal to immediately enable the audio channel, yet delays the audio channel shut-off if the signal is in a "flutter" condition. The voltage necessary to enable the carrier squelch switching logic is approximately 3.8 volts dc.

A voltage greater than 5 volts dc at the detector output (rf carrier signal level that produces 20 dB quieting or better with the SQUELCH control set at threshold), turns the long "squelch tail" defeat switch on. This disables the long "squelch tail" circuit and the 150 millisecond delay function. Audio channel disabling now occurs immediately after the rf carrier disappears.

2.6.3 Squelch Output Circuit

The squelch control logic circuit directly controls the shunt switches.

The output of the squelch control logic circuit depends upon the output of the preceding carrier squelch switching logic circuit. With the carrier squelch switch logic circuit off, the squelch control logic circuit will turn the shunt switches off, allowing a message to be heard. If the carrier squelch switch logic is on, the squelch control logic circuit will turn the shunt switches on, disabling the audio channel, and activating the series switches in the line driver or local logic board. Capacitor C237, connected to U202-10, slows the turn-off of the shunt switches to "soften" what would otherwise be any annoyingly abrupt turn-on of the audio. This same point (U202-10) supplies a digital output voltage that can be used as an indicator that the receiver is unsquelched (audio channel enabled).

Two additional functions that may affect the squelch control logic output are associated with "Private-Line" operation. PL disable (U202-14) may be either shorted to ground or open. When an open is present at U202-14 (PL disabled), a received signal with or without a PL code will be heard from the speaker. When at ground potential (PL enabled), the output of the carrier squelch switching logic circuit is inhibited. When the proper PL code is received, a +9.5 volts dc from the PL decoder board to U202-8 turns the squelch control logic circuit off which turns the shunt switches off and allows a message to be heard. Jumper JU204 is normally in the circuit and is only cut when a field modification is made. The cutting of this jumper *and associated modifications on the receiver interconnect board* will provide "AND SQUELCH" operation, changing the PL squelch circuitry from fixed sensitivity operation to variable sensitivity operation. Under this mode of operation, the SQUELCH control will affect the squelch sensitivity.

Audio disabling is performed by shunting the audio circuit to ground through a low impedance path and also by the operation of a series switch in the line driver or local logic board. When the solid state shunt switch is turned on (U202-7), signals developed across R236 are shunted to ground. This prevents any signals from being heard at the speaker. Acting in tandem with the first shunt switch, the second shunt switch output is routed to the line driver or local logic board and enables a set of switches on either of the boards. In a remote control system, this breaks the audio path and prevents audio from appearing on the 600-ohm line. In a local control system, these series switches also break the audio path, thus preventing any audio or hum and noise from reaching the speaker.

3. MAINTENANCE

3.1 GENERAL

This section of the manual provides maintenance shop type procedures for the audio and squelch board. It assumes that preliminary tests have already localized the trouble to this board. These bench tests include procedures for testing and troubleshooting, including integrated circuit check-out.

NOTE

The audio and squelch board must be installed in a station for testing to provide the necessary power and ground connections.

3.2 PERFORMANCE TESTS

The performance test may be used for troubleshooting to isolate the point of abnormal operation. They may also be used after repair to assure that the board is operating properly before it is returned to service.

3.2.1 Audio Amplification

3.2.1.1 Specifications

The audio section of the audio and squelch board combined with the separate audio power amplifier transistors will provide at least 10 watts (5 watts local) audio output at less than 5 per cent distortion from a 3.0 kHz deviated, 1 kHz modulated on-frequency signal applied to the station antenna receptacle.

3.2.1.2 Procedure

Step 1. Replace the speaker with an 8 ohm, 15 watt non-inductive resistor. In local control stations, disconnect the autotransformer.

Step 2. Set the SQUELCH control fully counterclockwise (unsquelched). "Private-Line" stations must also be PL disabled.

Step 3. Connect an rf signal generator to the station antenna receptacle and adjust it to the receiver frequency.

Step 4. Adjust the signal generator for 1000 microvolt output, modulated with 1000 Hz tone at ± 5.0 kHz deviation.

Step 5. Connect an AC voltmeter to pin J903-7 at the receiver interconnect board.

Step 6. Adjust the line level control R203 for 175 mV ac rms.

Step 7. Reduce the deviation to ± 3.0 kHz.

Step 8. Connect an AC voltmeter across the 8 ohm resistor.

Step 9. Adjust the VOLUME control until 9.0 volts ac rms is read on the ac voltmeter (this represents 10 watts).

Step 10. Measure distortion at 10 watts audio power output. It should be less than 5%.

3.2.2 Squelch Control

3.2.2.1 Specifications

3.2.2.1.1 The squelch section of the receiver audio and squelch board shall enable the audio section when an rf signal level greater than 6 dB noise quieting (one-half the discriminator output level with no signal input) is applied to the receiver with the SQUELCH control set at threshold. When the signal is removed from the station, the audio channel shall become disabled after approximately 150 milliseconds. When an

input signal greater than that required for approximately 20 dB noise quieting is removed from the station, the audio channel shall become disabled immediately.

3.2.2.1.2 When the SQUELCH control is turned fully clockwise (tight squelch) an input signal that produces about 20 dB noise quieting shall be required to enable the audio channel.

3.2.2.1.3 The squelch section shall inhibit audio output when no input signal is received.

3.2.2.1.4 In “Private-Line” stations, the squelch section of the receiver’s audio and squelch board shall perform as described in paragraphs 3.2.2.1.1, .2, and .3 while the radio set is PL disabled.

3.2.2.1.5 In PL operation, the squelch section shall inhibit audio output when the proper PL code is not received, regardless of the input signal strength.

3.2.2.2 Procedure

3.2.2.2.1 Carrier Squelch Stations

Step 1. Turn the station on and adjust the SQUELCH control clockwise from the full counterclockwise position until the receiver just quiets (threshold squelch).

Step 2. Measure the resistance of U202-6 and -7 with reference to ground. Both pins should be less than 1000 ohms.

NOTE

Erroneous readings will be obtained in resistance measurements if the voltage between the ohmmeter probes exceeds approximately 5.0 volts dc.

Step 3. Connect a signal generator to the station antenna receptacle and adjust it to the receiver frequency. Modulate the generator output with a 1000 Hz tone at ± 3.0 kHz deviation.

Step 4. Increase the signal generator output slowly until the receiver just unsquelches. Remove the modulation from the signal generator. Unsquelching should occur at a generator output that produces 6 dB noise quieting, or less.

Step .5 Measure the resistances of U202-6 and -7 with reference to ground. Both pins should be greater than 200,000 ohms.

Step 6. Increase the signal generator output until approximately 12 dB noise quieting is obtained. Remove the rf signal from the station input either by turning off the signal generator or by using a relay in series with the signal generator output. A long “squelch tail” should occur. If a calibrated, triggered sweep oscilloscope is

available for measurement, the duration of the “squelch tail” should be approximately 150 milliseconds as measured at the speaker.

Step 7. Increase the signal generator output to produce 30 dB noise quieting. Turn off the rf signal and note the “squelch tail” duration. It should be no more than a “click”. The duration should be less than 10 milliseconds.

Step 8. Turn the SQUELCH control fully clockwise (tight squelch).

Step 9. Adjust the signal generator output level until the station just unsquelches. Unsquelching should occur at a generator output that produces approximately 20 dB noise quieting.

3.2.2.2.2 “Private-Line” Stations

Step 1. Disabled the PL circuitry.

Step 2. Perform previously described carrier squelch station procedure.

Step 3. Return the station to PL operation. On stations using “AND” squelch operation, also turn the SQUELCH control fully counterclockwise during this test.

Step 4. Vary generator output between minimum output and 1000 microvolt output while checking the resistances of U202-6 and -7 with reference to ground. Both resistances should remain at less than 1000 ohms.

Step 5. Modulate the on-frequency generator output with a PL code for ± 0.5 to ± 1 kHz deviation and 1000 Hz tone for ± 3.0 kHz overall deviation.

Step 6. Increase the signal generator output slowly until the receiver just unsquelches. Unsquelching should occur at a generator output that produces 6 dB quieting, or less.

3.3 TROUBLESHOOTING

3.3.1 Check Input Voltages

A malfunction in the audio and squelch operation may be due to the loss of dc input voltages which can be caused by this board or another section of the station. Since there are only two input voltages applied to this board, it is advantageous to verify their presence before beginning extensive troubleshooting.

P903-1, -4	+ 9.6 V dc with respect to chassis
P903-16	Audio A + (approximately + 13.6 V dc with respect to A-)

In a negative ground system audio A- is at chassis potential. In a positive ground system, audio A+ is at chassis potential.

3.3.2 Isolating Defective Components

If tests indicate abnormal performance, a logical troubleshooting procedure should be followed to isolate the defective component efficiently. Results of performance test usually localize the malfunction to one or two stages. The accompanying troubleshooting chart summarizes these results in a logical sequence. A few waveforms, voltage and resistance checks in the suspected circuit should readily isolate the defective component when compared with those on the schematic diagram.

3.3.3 Troubleshooting Integrated Circuits

Integrated circuits (IC's) are very reliable components and should not be replaced until all checks have proven definitely that the IC is the defective component. Make sure that the external components in the circuit are normal. The IC's on the audio and squelch board may be checked by dc voltage measurements although signal tracing with an oscilloscope is preferred.

3.3.4 Stage Gain Measurements

3.3.4.1 Squelch Circuitry

3.3.4.1.1 This troubleshooting procedure may be used to isolate a squelch malfunction occurring before the detector to a specific state. The test is performed by injecting an ac signal at the input to the squelch circuitry and noting results obtained with an ac voltmeter. Most accurate results are obtained by taking dB gain and loss measurements between points as illustrated in Figure 2. Individual point voltage checks may also be used to quickly verify proper squelch input circuitry operation but this is not an adequate test to prove the circuitry is defective (refer to the following table and Figure 2). Tolerance addition *may* cause increasing variation from the typical readings in the table

as readings are taken further from the injected signal point.

3.3.4.1.2 The following procedure may be used for loss and gain or signal level measurements while injecting a 3 kHz or 30 kHz signal. In "Private-Line" radios, PL operation will not affect this test.

Step 1. Turn the VOLUME control fully counterclockwise (off), or to a comfortable listening level, if desired.

Step 2. Turn the SQUELCH control fully clockwise (squelched) and turn the station on.

Step 3. Inject a 1000 microvolt, on-channel signal at the station antenna receptacle. This "quiets" the discriminator output and prevents erroneous test readings.

Step 4. Inject a 3 kHz, 10 millivolt rms signal at the receiver audio & squelch board at P903-9.

Step 5. Take loss and gain measurements or signal level measurements as required.

Step 6. Repeat the preceding test using a 30 kHz signal in place of the 3 kHz signal in Step 4.

3.3.4.2 Audio Circuitry

AC voltage measurements and waveforms are given where applicable on the schematic diagram. Refer to this diagram for pertinent information when taking audio stage gain measurements.

AC Voltmeter Connected to U202-Pin	AC Voltmeter Reading with 3 kHz Signal Input (mV)	AC Voltmeter Reading with 30 kHz Signal Input (mV)
15	3.5	9.5
1	40	110
2	7	85
3	80	950
4	24	750

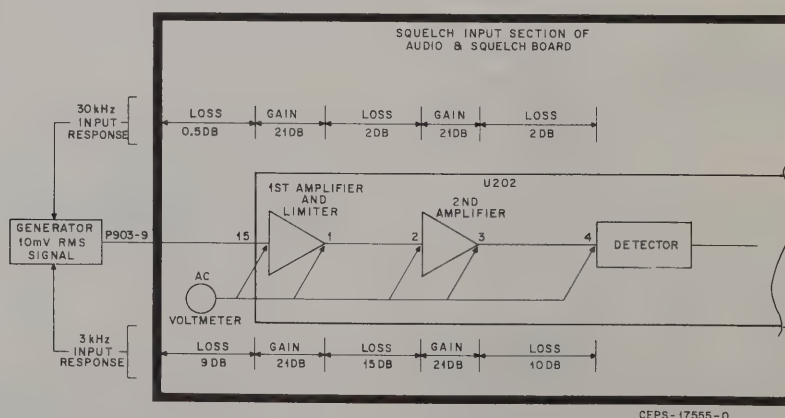
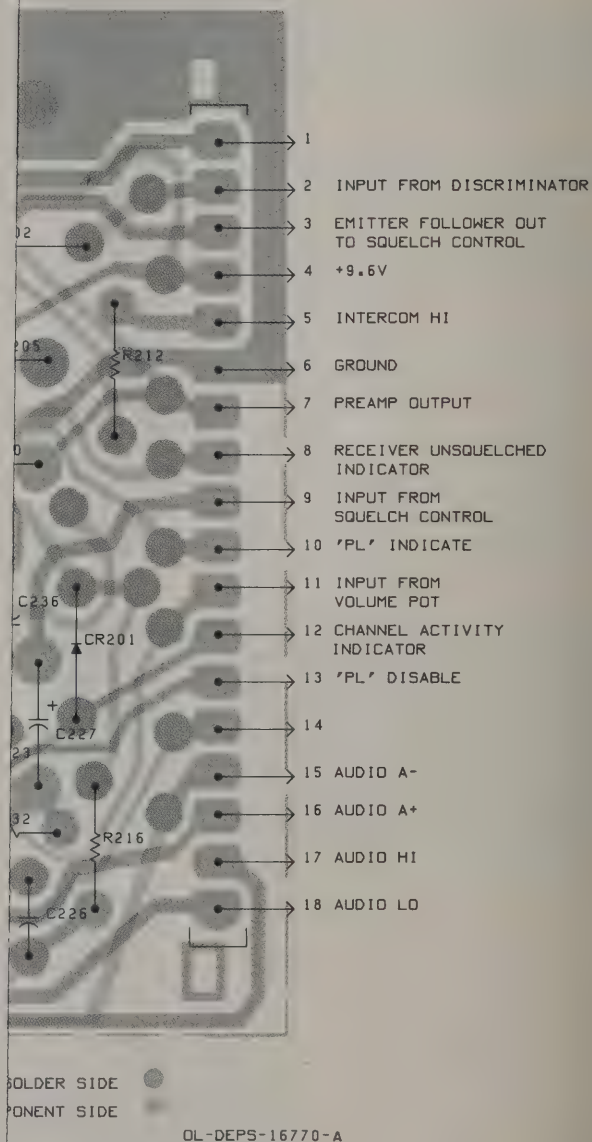


Figure 2. Squelch Circuitry Stage Gain Measurements

“MICOR” “SENSITRON” **UHF RECEIVER** **AUDIO & SQUELCH BOARD**

MODEL TRN6006A, 7A



“MICOR” “SENSITRON” UHF RECEIVER AUDIO & SQUELCH BOARD

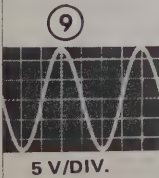
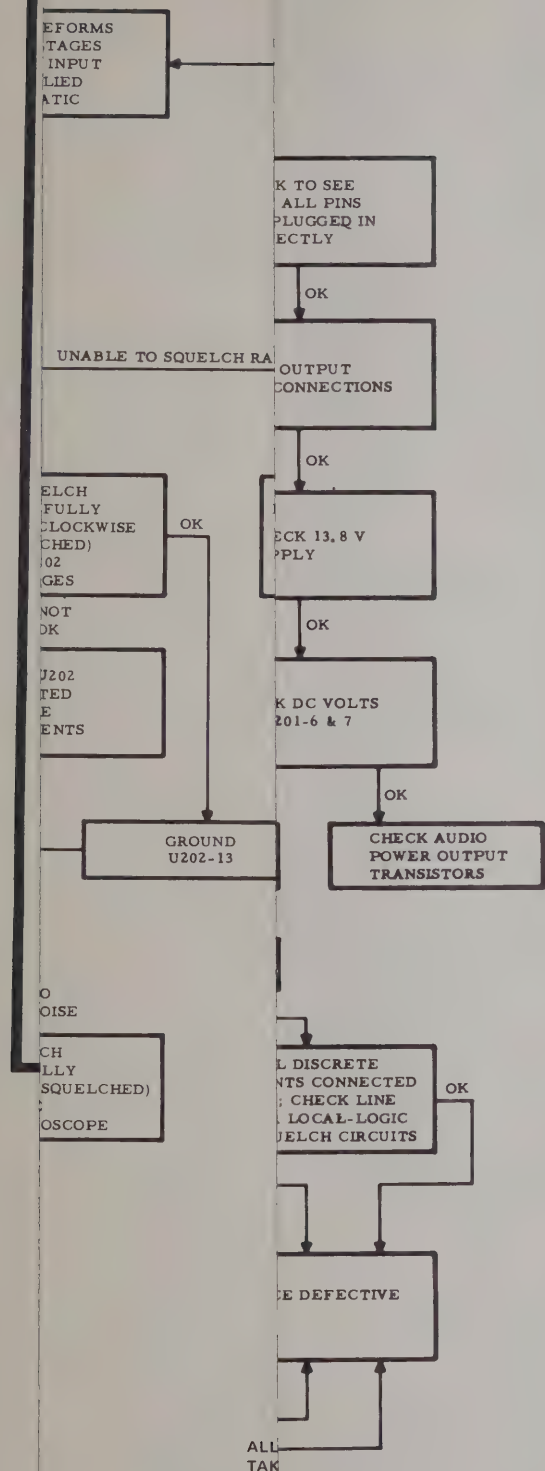
MODEL TRN6006A, 7A

FUNCTION

- Provides amplification of the low level audio output signal from the receiver rf and i-f.
- Provides audio squelch action

Model Usage

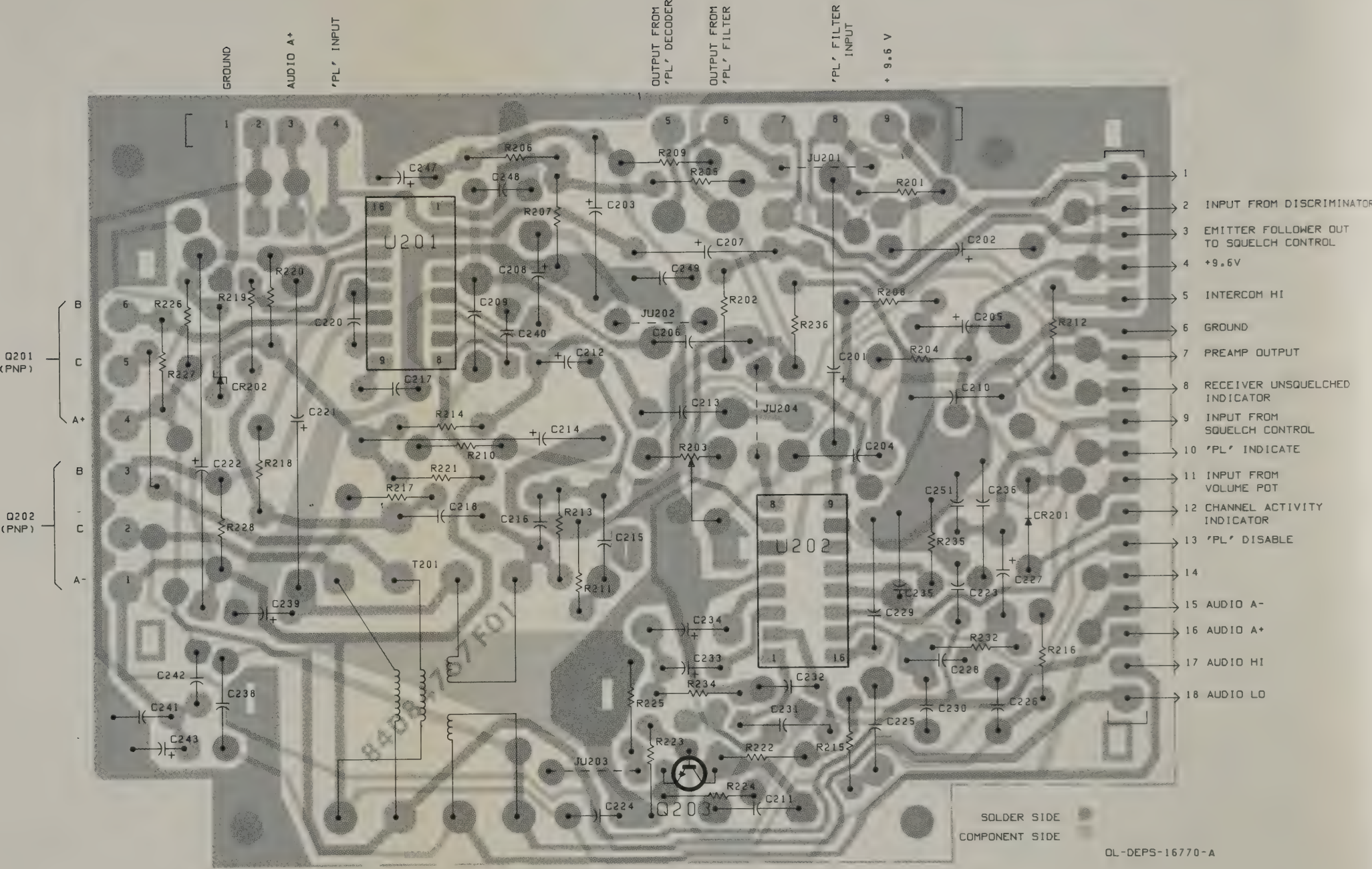
Receiver Frequency Range	TRN6006A	TRN6007A
25-50 MHz		X
72-76 MHz		X
132-174 MHz	X	
406-512 MHz	X	



PARTS LIST SHOWN ON BACK

Motorola No. PEPS-16952-G
(Sheet 2 of 2)
6/20/80-PHI

“MICOR” “SENSITRON”
UHF RECEIVER
AUDIO & SQUELCH BOARD
 MODEL TRN6006A, 7A

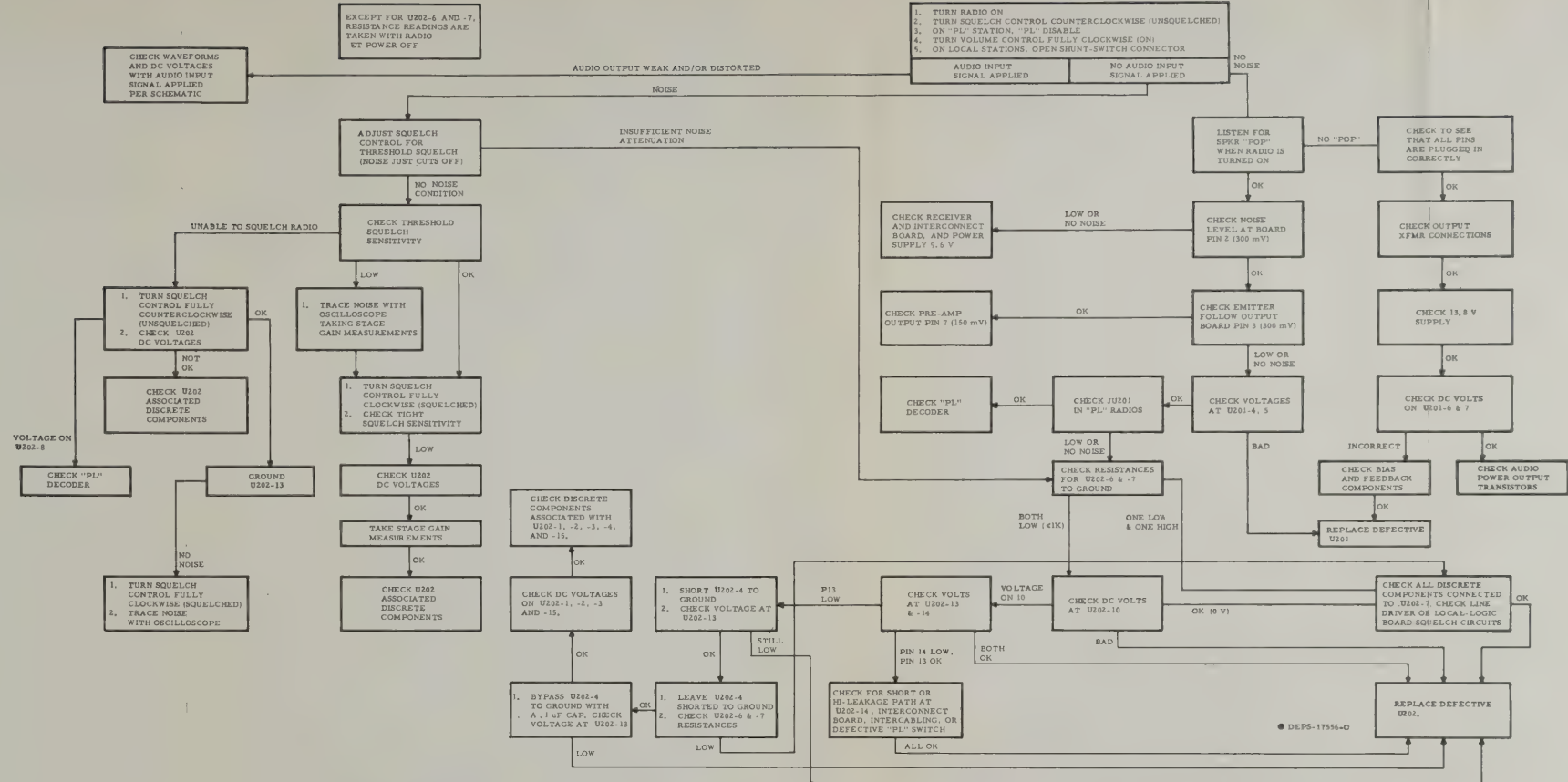


AUDIO & SQUELCH BOARD

- Provides amplification of the low level audio output signal from the receiver rf and i-f.

AUDIO & SQUELCH BOARD

Motorola No. PEPS-16952-G
(Sheet 2 of 2)
6/20/80-PHI



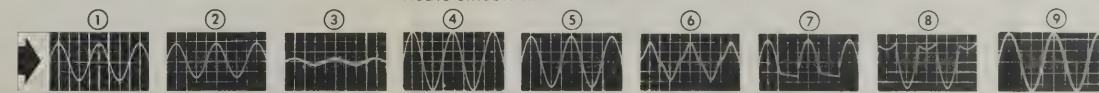
1. VERTICAL SENSITIVITY SHOWN UNDER EACH WAVEFORM

⑫ ⑬ ⑭

1. VERTICAL SENSITIVITY = 0.5 V/DIV.
2. HORIZONTAL DEFLECTION = 2 msec/DIV.
3. SQUELCH CONTROL FULLY CLOCKWISE (ON). NO EXTERNAL



④ ⑤



"MICOR" "SENSITRON" RECEIVER AUDIO & SQUELCH BOARD

MODEL TLN4754A (25-50 MHz & 72-76 MHz)

MODEL TLN4725A (132-174 MHz)

FUNCTION-

Provides audio amplification and audio squelching.

RECEIVER AUDIO & SQUELCH BOARD

201. +5.6 VOLTS WHEN THRESHOLD SIGNAL JUST OPENS SQUELCH (I.E., APPROXIMATELY 6 dB QUIETING SIGNAL WITH SQUELCH CONTROL AT THRESHOLD).
202. WHERE MORE THAN ONE VOLTAGE READING APPEARS:
USQ = RECEIVER UNSQUELCHED
FSQ = RECEIVER FULLY SQUELCHED
203. VOLTAGE MEASURED WITH RESPECT TO A-.
204. VOLTAGE MEASURED WITH RESPECT TO A+.
205. VOLTAGES AT IC201-6 AND -7 MUST BE THE SAME VALUE.
206. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICOFARADS.
207. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES $\pm 10\%$ MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND.
208. AUDIO POWER AMPLIFIER IS NOT PART OF AUDIO & SQUELCH BOARD.
209. JUMPER JU204 MUST BE REMOVED FOR "AND SQUELCH" OPERATION (SEE "RECEIVER INTERCONNECT UNIT" SECTION).

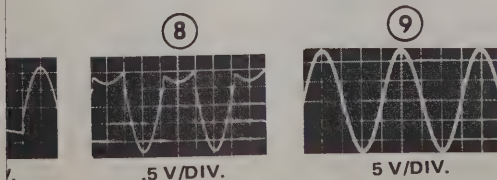
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JUMPER TABLE

JUMPER	USE
JU201	CONNECTED IN CARRIER SQUELCH STATIONS.
JU202	CONNECTED IN CARRIER SQUELCH STATIONS.
JU203	CONNECTED TO PROVIDE 10 WATTS AUDIO AT SPEAKER WITH LINE LEVELS OF -10 dBm OR LESS (REMOTE CONTROL STATIONS ONLY).
JU204	CUT FOR "AND SQUELCH"

EPS-9062-A

RECEIVER AUDIO & SQUELCH BOARD



REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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PARTS LIST

LEGEND
L = 25-50 & 72-76 MHz
H = 132-174 MHz, 406-450 MHz, 450-512 MHz
TRN6007A Receiver Audio & Squelch Board
(25-50 & 72-76 MHz)
TRN6006A Receiver Audio & Squelch Board
(132-174 MHz, 406-450 MHz, 450-512 MHz),
PL-3269-E

This parts list covers two models of the Receiver Audio & Squelch Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.		
		CAPACITOR, fixed: uF; ±10%; 100 V; unl. stated
C201	23-83210A01	25 ±150-10%; 25 V
C202	23-82783B36	39; 10 V
C203	23-84762H10	22 ±20%; 15 V
C204	8-83813H12	.0047
C205	8-83813H11	0.22; 75 V
C206	8-83813H29	0.33; 50 V
C207	23-82783B24	15; 25 V
C208	8-83813H01	.0068
C209	8-83813H26	.0056 ±5%; 50 V
C210L	8-82905G45	.081; 50 V
C210H	8-83813H03	.021; 50 V
C211	8-83813H01	0.22; 75 V
C212	21-848236	650 pF ±5%; 500 V
C213	8-83813H11	0.22; 75 V
C214	23-84081B03	75 ±150-10%; 15 V
C215	8-83813H11	0.22; 75 V
C216L	21-82187B20	1000 pF
C216H	21-82187B31	1500 pF
C217	21-82187B43	.0039; 200 V
C218	8-83813H11	0.22; 75 V
C219		NOT USED
C220	21-83466D46	56 pF ±5%; 500 V; N150
C221	23-84081B01	50 ±100-10%; 25 V
C222	23-83210A08	100 ±150-10%; 25 V
C223, 224	21-82372C04	.05 ±80-20%; 25 V
C225	8-82905G16	.033
C226	21-859942	220 pF ±5%; 500 V
C227	8-83813H07	0.15; 75 V
C228	21-84426B63	1500 pF ±5%
C229	23-84762H07	4.7 ±20%; 10 V
C230	21-84426B06	100 pF ±5%; 500 V
C231	21-84493B05	1000 pF; 200 V; N2200
C232	21-82133G03	100 pF ±5%; 500 V; N750
C233	21-84426B11	470 pF ±5%; 500 V
C234	8-83813H31	.01; 100 V
C235	8-83813H11	0.22; 75 V
C236	23-84762H08	3.9 ±20%; 15 V
C237		NOT USED
C238	21-82372C01	0.1 ±80-20%; 25 V
C239	21-83596E10	220 pF ±20%; 500 V
C240	21-832501	.01 ±60-40%; 250 V
C241, 242	21-83596E10	220 pF ±20%; 500 V
C243	21-832501	.01 ±60-40%; 250 V
C244	21-82133G03	100 pF ±5%; 500 V
C245, 246		NOT USED
C247	21-832501	.01 ±60-40%; 250 V
C248 thru 250	21-83596E10	220 pF ±20%; 500 V
C251	21-84426B11	470 pF ±5%; 500 V
CR201	48-83654H01	DIODE; (SEE NOTE) silicon
P201		CONNECTOR, plug; consists of contact pins mounted on circuit board
Q203	48-869642	TRANSISTOR; (SEE NOTE) NPN; type M9642
R201, 202	6-124A61	RESISTOR, fixed: ±5%; 1/4 W; unl. stated
R203	18-83083C24	3.3k
R204	6-124C05	variable: 25k ±30% 15 ±10%

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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R205	6-124A49	1k
R206	6-124A93	±8k
R207	6-124A99	120k
R208	6-124A73	10k
R209	6-124C17	47 ±10%
R210	6-124A51	1.2k
R211	6-124A63	3.9k
R212	6-124A49	1k
R213	6-124C07	100k ±10%
R214	6-124A89	47k
R215	6-124A49	1k
R216	6-124A57	2.2k
R217	6-124C01	10 ±10%
R218, 219	6-124A09	22
R220, 221	6-124A71	8.2k
R222	6-124A95	82k
R223	6-124A83	27k
R224	6-124A45	680
R225, 226	6-124C17	47 ±10%
R227, 228	6-124A61	3.3k
R229 thru 231		NOT USED
R232	6-124A81	22k
R233		NOT USED
R234	6-124A83	27k
R235	6-124D04	180k ±10%
R236	6-124C89	47k ±10%
T201	25-84083B02	TRANSFORMER, AF; pri: split winding; total res 0.5 Ohms max sec: res 0.8 Ohms max feedback: res 2 Ohms max
U201	51-82848M70	INTEGRATED CIRCUIT; (SEE NOTE) type M4870
U202	51-84561L79	(SEE NOTE) type M6179
VR1	48-82256C38	DIODE; (SEE NOTE) Zener; 9.1 V; 400 mW
NON-REFERENCED ITEMS		
	42-84284B01	RETAINER; 4 req'd.
	3-138162	SCREW, tapping; Phillips rd. hd., 4-40 x 3/8"; 4 req'd. (used for mounting Retainers)
	55-84300B01	HANDLE (long)
	55-84300B02	HANDLE (short)
	29-84028H01	TERMINAL, contact; 18 req'd. (long)
	29-84028H02	TERMINAL, contact; 24 req'd. (short)

NOTE: Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

REVISIONS PEP-16952-G

CHASSIS AND SUFFIX NO.	REF SYMBOL	CHANGE	LOCATION
TRN6006A TRN6007A	C237	DELETED 21-84762H04, 2.2 uF, WAS CONNECTED BETWEEN GROUND AND PIN 18 OF U202.	U202
	U201	WAS TYPE SC708 (p/n 51-84267A08).	
	U202	WAS TYPE SC709 (p/n 51-8467A09).	

"MICOR" "SENSITRON" RECEIVER AUDIO & SQUELCH BOARD

MODEL TLN4754A (25-50 MHz & 72-76 MHz)
MODEL TLN4725A (132-174 MHz)

FUNCTION-

Provides audio amplification and audio squelching.

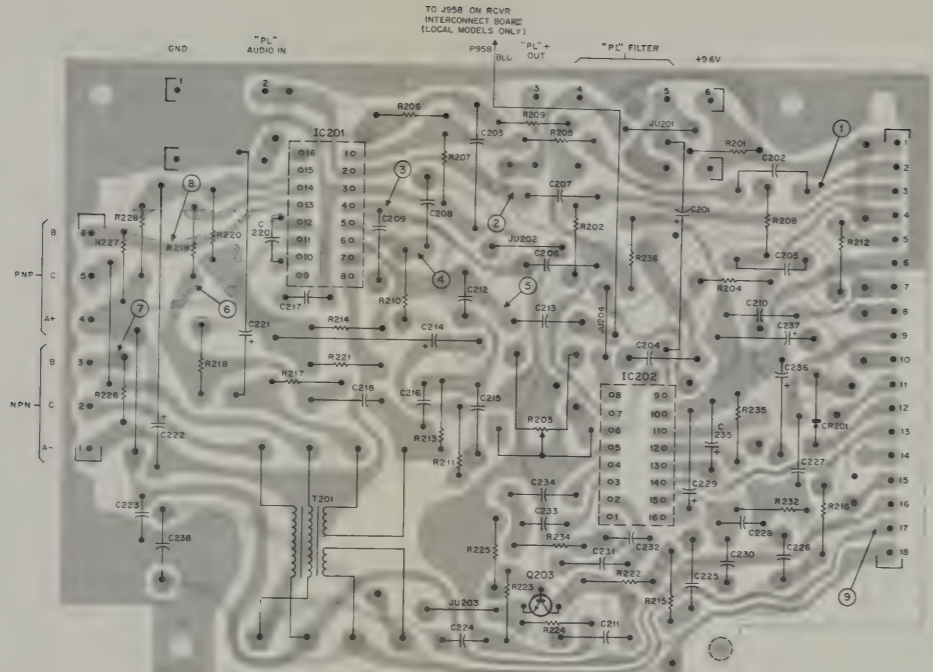
RECEIVER AUDIO & SQUELCH BOARD

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207. UNLESS OTHERWISE STATED: VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES ± 10% MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND.
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209. JUMPER JU204 MUST BE REMOVED FOR "AND SQUELCH" OPERATION (SEE "RECEIVER INTERCONNECT UNIT" SECTION).

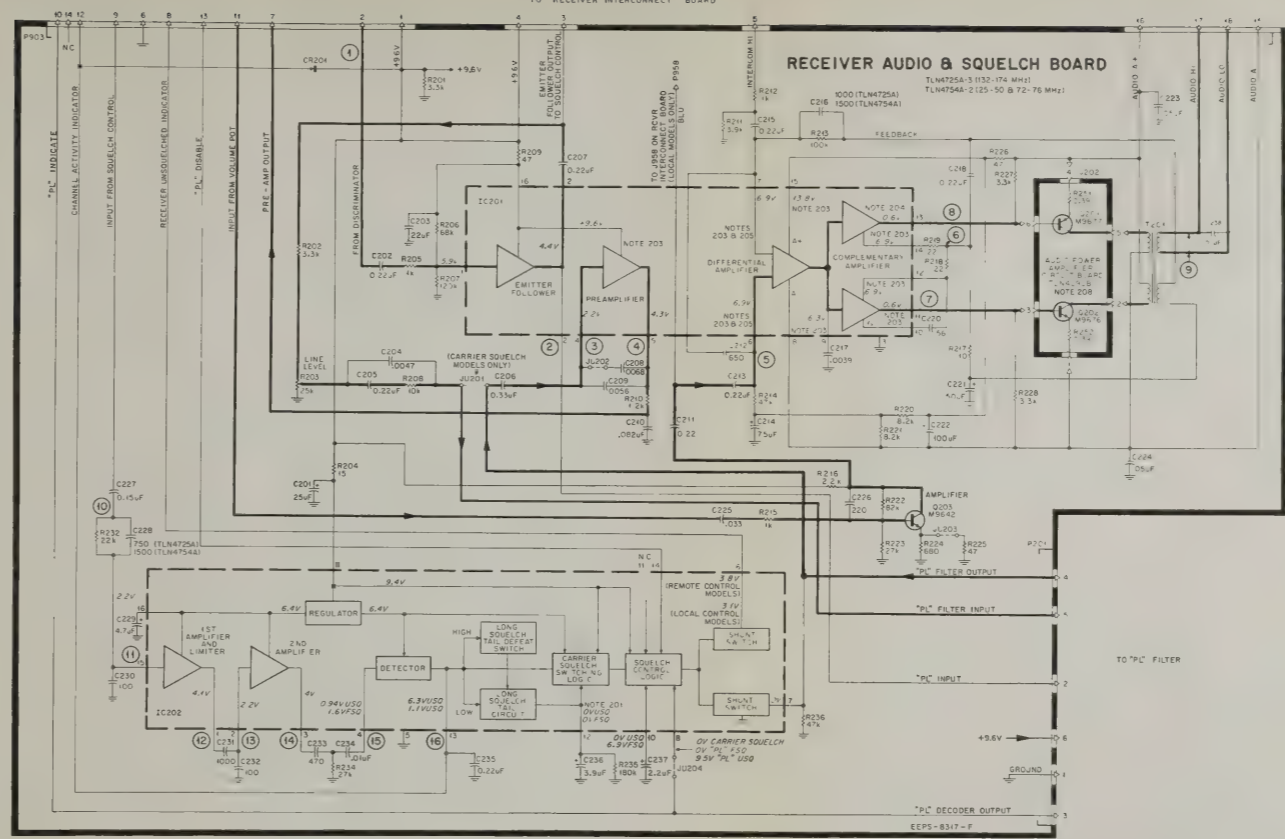
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JUMPER	NOTE
JU201	CONNECTED TO "AND SQUELCH" POSITION
JU202	CONNECTED TO "AND SQUELCH" POSITION
JU203	CONNECTED TO "AND SQUELCH" POSITION
JU204	CUT FOR "AND SQUELCH"

CONTINUED



SOLDER SIDE
COMPONENT SIDE
OL-DEPS-8324-C

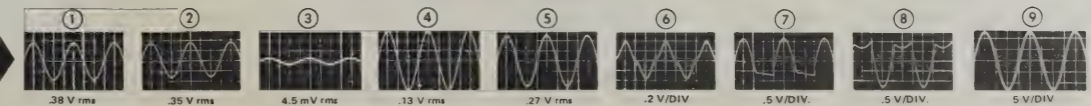


ALL AUDIO CIRCUIT OSCILLOSCOPE WAVEFORMS
TAKEN UNDER THE FOLLOWING CONDITIONS

1. VERTICAL SENSITIVITY SHOWN UNDER EACH WAVEFORM
2. HORIZONTAL DEFLECTION = 2 msec/DIV
3. SQUELCH CONTROL FULLY COUNTERCLOCKWISE (OFF). 1000 uV RF SIGNAL INPUT MODULATED WITH 1000 Hz TONE WITH ±3.0 kHz DEVIATION
4. VOLUME CONTROL SET FOR 9.0 V rms AT LOAD
5. OUTPUT TERMINATED IN 8 OHM LOAD
6. R203 SET FOR 175 mV AT PIN 7 WITH ±5 kHz DEVIATION (1 kHz TONE)

EPS-8804-D

AUDIO CIRCUIT WAVEFORMS



68P81030E46-B
6/20/80-PHI

RECEIVER AUDIO & SQUELCH BOARD



MOTOROLA INC.

Communications
Group

AUDIO POWER AMPLIFIER

MODEL TLN4290B

1. DESCRIPTION

The audio power amplifier provides the required power to drive an 8-ohm speaker with 10 watts of audio power, or a 16-ohm speaker with 5 watts of audio power, with less than 5% overall distortion. Two complementary power transistors (NPN and PNP types), operating class AB, with two current limiting resistors, develop this power. The audio drive from the audio and squelch board is routed to this board, amplified, and then returned to the audio and squelch board, where it is applied to the audio output transformer.

The aluminum transistor mounting plate is anodized with a thin, very tough material. This mounting plate provides excellent electrical insulation and thermal conduction properties between the transistors and the heat-sink.

2. SERVICING

a. Performance Checks

Performance checks on this board consists of taking resistance readings as is done for any transistor or resistor. It should be noted, however, that many VTVM's and solid-state multimeters do not have sufficient voltage at the test probes to forward bias a transistor junction into conduction and, therefore, should not be used. An inexpensive volt-ohm meter of 1,000 to 20,000 ohms-per-volt sensitivity is sufficient for performing these checks.

NOTE

Do not insert meter test probe tips into female connectors on the board. To do so could cause damage to the connectors and result in poor electrical interconnection with the audio and squelch board.

b. Transistor Replacement

Care must be exercised to prevent damage (such as a scratch) to the mounting plate anodizing at the transistor-mounting plate interface. Should the anodizing in this area become scratched, original performance can only be restored by the use of a new anodized plate. The plate can *not* be "repaired" by the use of any type of insulating washer without a loss in thermal conduction capability.

Factory replacement transistors are supplied with pre-formed leads to properly fit onto the aluminum mounting plate and circuit board. A new nylon shoulder washer is also included.

Step 1. Apply a thin, even coat of silicon grease to the metallic area of the transistor.

Step 2. Mount the transistor using the *new* nylon shoulder washer. Do not solder leads at this time. Tighten the transistor mounting screw.

Step 3. Solder transistor leads to printed circuit board.

TRANSISTOR RESISTANCE MEASUREMENT CHECK (BOARD REMOVED FROM RADIO — TRANSISTORS MOUNTED ON BOARD)

Ohmmeter Connections		Proper Resistance	
Positive Lead Connected to	Negative Lead Connected to	P-N-P Transistor	N-P-N Transistor
Base	Emmitter, then Collector	Infinite	5-30 Ohms, Both Cases
Emmitter, then Collector	Base	5-30 Ohms, Both Cases	Infinite
Collector	Emitter	Infinite	Infinite
Emitter	Collector	Infinite	Infinite

Failure to obtain these results indicates a defective transistor which must be replaced.

technical writing services

LEGEND
L - 25-50 MHz & 72-76 MHz
H - 132-174 MHz

[illegible]

Audio & Squelch Board
TLN4754A (25-50 MHz & 72-76 MHz)
TLN4725A (132-174 MHz) PL-1707-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed; uF; ±10%;
C201	23-83210A01	100 uF, unat'd
C202	8-83813H01	25 ±10%-10%; 25 V
C203	8-83813H01	0.22; 75 V
C204	23-84028H01	22 ±5 V
C205	8-83813H12	.0047
C206	8-83813H01	0.22; 75 V
C207	8-83813H01	0.31; 50 V
C208	8-83813H01	0.22; 75 V
C209	8-83813H01	.0068
C210	8-83813H26	.0068 ±5%; 50 V
C210	8-82905G45	.082
C211	8-83813H01	0.22; 75 V
C212	23-848236	650 pF ±5%; 500 V
C213	8-83813H01	0.22; 75 V
C214	23-848236	75 ±150-10%; 15 V
C215	8-83813H01	0.22; 75 V
C216L	21-82187B31	1500 pF
C216H	8-83813H01	1000 pF
C217	23-82187B43	1000; 200 V
C218	8-83813H01	0.22; 75 V
C219	23-84004G46	50 pF ±5%; 50 V, N150
C220	23-84091R01	50 ±100-10%; 25 V
C221	23-83210A0R	100 ±20%; 25 V
C222	23-83210A0R	100 ±20%; 25 V
C223	23-83210A0R	.05 ±80-20%; 25 V
C224	8-82905G16	.033
C225	21-88994Z	220 pF ±5%; 500 V
C226	8-83813H01	51; 75 V
C227	23-84826B63	1500 pF ±5%
C228H	21-848519	750; 100 V
C229	23-84826B07	4.7 ±20%; 25 V
C230	23-84826B06	1000 pF ±5%; 500 V
C231	21-84449B05	100 pF ±5%; 200 V, N2200
C232	23-84826B06	100 pF ±5%; 500 V
C233	8-83813H01	470 pF ±5%; 500 V
C234	23-84813H31	.01; 50 V
C235	8-83813H01	0.22; 75 V
C236	23-84762H08	3.9 ±20%; 15 V
C237	23-84762H04	2.2 ±20%; 25 V
C238	21-82372C01	0.1 ±80-20%; 25 V
		SEMICONDUCTOR DEVICE;
		diode; (SEE NOTE 1)
C238C1	48-83654H01	silicon
		INTEGRATED CIRCUIT:
IC201	51-82848H01	TYPE M6179
IC202	51-84561L79	TYPE M6179
		CONNECTOR, plug;
P201		consists of contact pins mounted on circuit board (SEE MECHANICAL PARTS LIST)
		TRANSISTOR: (SEE NOTE 1)
Q203	48-866642	N-P-N; type M9642
		R-R-P; fixed; ±5%; 1/4W;
		unat'd
R201, 202	6-129991	3 k
R203	18-83083G24	variable: 25k ±30%
R204	6-113177	1k
R205	6-129805	1k
R206	6-129249	68k
R207	6-11446	120k
R208	6-129858	10k
R209	6-129233	47 ±10%
R210	6-129708	1.2k
R211	6-129819	3 k
R212	6-129805	1k
R213	6-129226	100k ±10%
R214	6-11327	47k
R215	6-129805	1k
R216	6-129804	2.2k
R217	6-129755	10 ±10%
R218, 219	6-1274A09	22
R220, 221	6-129983	8.2k
R222	6-1244A05	82k
R223	6-129826	27k
R224	6-129944	47k
R225, 226	6-129233	47 ±10%
R227	6-129941	3.3k
R228	6-129981	3.3k
R229	6-129667	22k
R230	6-129886	27k
R231	6-129819	180k ±10%
R236	6-128902	47k ±10%

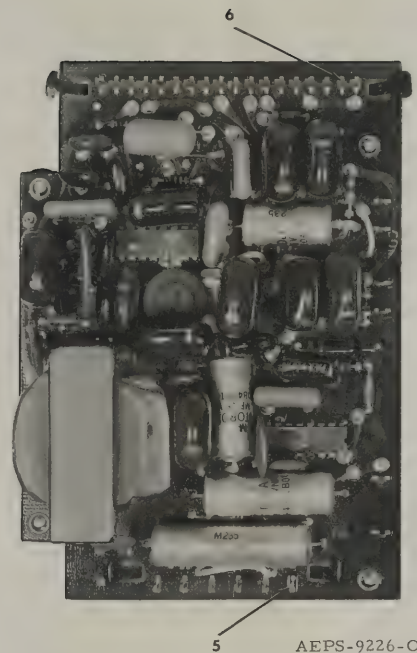
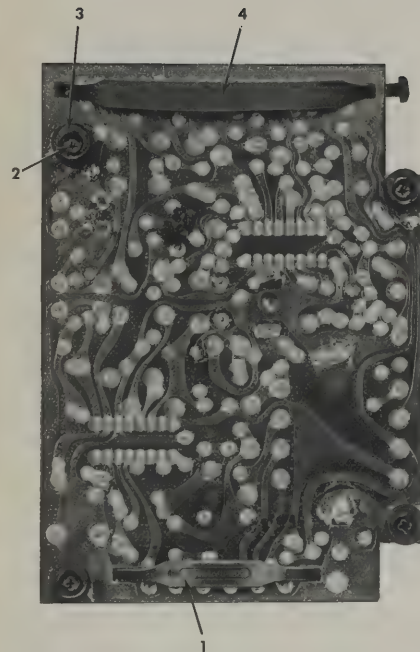
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1201	25-84083B02	TRANSFORMER. AF: pri: split winding; total res 0.5 Ohms max sec: res 0.8 Ohms max feedback: res 2 Ohms max

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

Audio & Squelch Board, Models: TLN4289A and B;
TLN4310A and B, TLN4725A and TLN4754A

CODE NO.	MOTOROLA PART NO.	DESCRIPTION
1	55B 84300B02 3S136905	HANDLE (short) LOCKSREW, tapping: #4 x 5/16" (4 req'd)
3	42C 84284B01	RETAINER, screw (4 req'd)
4	55B 84300B01	HANDLE (long)
5	29C 84028H02	PIN (short)
6	29C 84028H01	PIN (long)



AEPS-9226-O

Models TLN4725A and TLN4754A
Receiver Audio & Squelch
Parts List
Motorola No. PEPS-9225-F
6/20/80-PHI



MOTOROLA INC.

Communications
Group

AUDIO POWER AMPLIFIER

MODEL TLN4290B

1. DESCRIPTION

The audio power amplifier provides the required power to drive an 8-ohm speaker with 10 watts of audio power, or a 16-ohm speaker with 5 watts of audio power, with less than 5% overall distortion. Two complementary power transistors (NPN and PNP types), operating class AB, with two current limiting resistors, develop this power. The audio drive from the audio and squelch board is routed to this board, amplified, and then returned to the audio and squelch board, where it is applied to the audio output transformer.

The aluminum transistor mounting plate is anodized with a thin, very tough material. This mounting plate provides excellent electrical insulation and thermal conduction properties between the transistors and the heat-sink.

2. SERVICING

a. Performance Checks

Performance checks on this board consists of taking resistance readings as is done for any transistor or resistor. It should be noted, however, that many VTVM's and solid-state multimeters do not have sufficient voltage at the test probes to forward bias a transistor junction into conduction and, therefore, should not be used. An inexpensive volt-ohm meter of 1,000 to 20,000 ohms-per-volt sensitivity is sufficient for performing these checks.

NOTE

Do not insert meter test probe tips into female connectors on the board. To do so could cause damage to the connectors and result in poor electrical interconnection with the audio and squelch board.

b. Transistor Replacement

Care must be exercised to prevent damage (such as a scratch) to the mounting plate anodizing at the transistor-mounting plate interface. Should the anodizing in this area become scratched, original performance can only be restored by the use of a new anodized plate. The plate can *not* be "repaired" by the use of any type of insulating washer without a loss in thermal conduction capability.

Factory replacement transistors are supplied with pre-formed leads to properly fit onto the aluminum mounting plate and circuit board. A new nylon shoulder washer is also included.

Step 1. Apply a thin, even coat of silicon grease to the metallic area of the transistor.

Step 2. Mount the transistor using the *new* nylon shoulder washer. Do not solder leads at this time. Tighten the transistor mounting screw.

Step 3. Solder transistor leads to printed circuit board.

TRANSISTOR RESISTANCE MEASUREMENT CHECK (BOARD REMOVED FROM RADIO — TRANSISTORS MOUNTED ON BOARD)

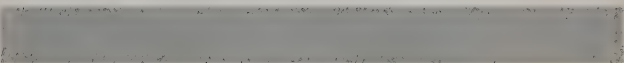
Ohmmeter Connections		Proper Resistance	
Positive Lead Connected to	Negative Lead Connected to	P-N-P Transistor	N-P-N Transistor
Base	Emmitter, then Collector	Infinite	5-30 Ohms, Both Cases
Emmitter, then Collector	Base	5-30 Ohms, Both Cases	Infinite
Collector	Emitter	Infinite	Infinite
Emitter	Collector	Infinite	Infinite

Failure to obtain these results indicates a defective transistor which must be replaced.

technical writing services

AUDIO POWER AMPLIFIER

MODEL TLN4290B

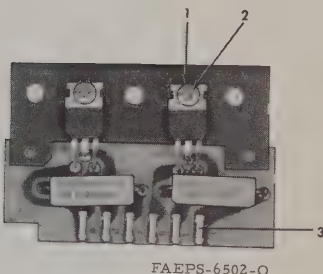
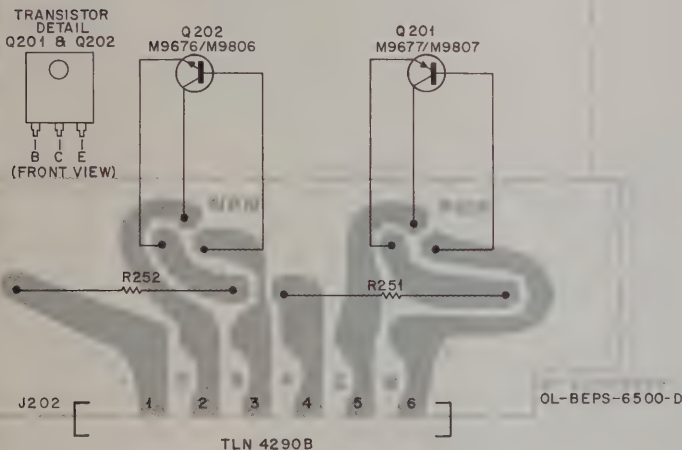


FUNCTION

— Provides up to 10 watts audio output.

AUDIO POWER AMPLIFIER

SHOWN FROM SOLDER SIDE



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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AUDIO POWER AMPLIFIER

TLN4290B Audio Power Amplifier PL-1061-D

J202		CONNECTOR, receptacle: c/o; 9B83011H01 PIN, female; 6 req'd
Q201	48R869807 or 48R869677	TRANSISTOR: (SEE NOTE) PNP; type M9807
Q202	48R869806 or 48R869676	PNP; type M9677 NPN; type M9806 NPN type M9676
R251	17D82177B49	RESISTOR, fixed; $\pm 10\%$; 3 W:
R252	17D82177B49	0.39
MECHANICAL PARTS		
1	4B84180C01	WASHER, shoulder
2	3S129841	SCREW, machine; No. 4-40 x 1/4"; incl. lockwasher
3	9B83011H01	PIN, female

Motorola No. PEPS-28290-O
6/20/80-PHI

AUDIO POWER AMPLIFIER

"DIGITAL PRIVATE-LINE" DECODER

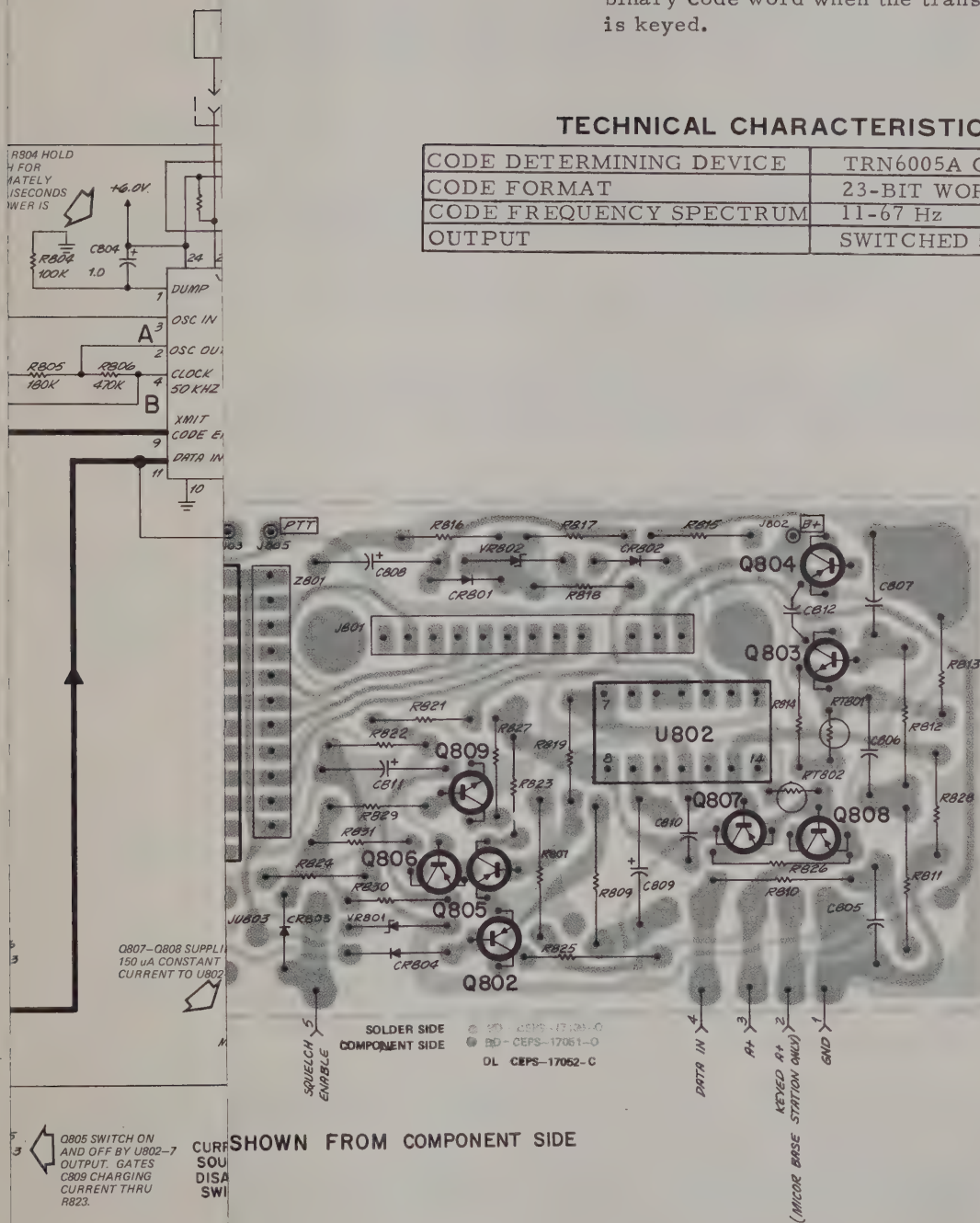
MODEL TLN5729A

FUNCTION

1. Decodes A 23-bit binary code word to unsquelch the receiver.
2. In radios with simplex "Digital Private-Line" operation, generates a 23-bit binary code word when the transmitter is keyed.

TECHNICAL CHARACTERISTICS

CODE DETERMINING DEVICE	TRN6005A CODE PLUG
CODE FORMAT	23-BIT WORD
CODE FREQUENCY SPECTRUM	11-67 Hz
OUTPUT	SWITCHED 5.3 V DC



"DIGITAL PRIVATE-LINE" DECODER

68P81026E13-F
6/20/80-PHI

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
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PARTS LIST

TLN5729A Decoder Circuit Board PL-3299-A

C801	21-83798B01	CAPACITOR, fixed: uF:
C802	21-82610C22	100 pF ±5%; 200 V
C803	21-82428B56	20 pF ±5%; 200 V
C804	23-82783B08	.0047 ±10%; 100 V
C805	8-82903C39	1.0 ±20%; 35 V
C806	8-82903C39	.023 ±5%; 50 V
C807	8-83181H13	.048 ±5%; 50 V
C808	8-83181H13	.0039 ±5%; 50 V
C809	23-84762H03	10 ±10%; 20 V
C810	23-82783B48	0.68 ±5%; 35 V
C811	21-82187B20	1000 pF ±10%; 100 V

CR801, 802	48-84616A01	DIODE: (SEE NOTE)
CR803	48-83654H01	hot carrier
CR804	48-82139C01	silicon
		germanium

Q801	48-867653	TRANSISTOR: (SEE NOTE)
Q802	48-869649	field-effect, type M9653
Q803, 809	48-869642	PNP; type M9649
Q804, 805, 806, 807	48-869643	PNP; type M9643
Q808	48-869841	PNP; type M9841

R801, 804, 811	6-124C97	RESISTOR, fixed: ±10%; 1/4 W, unless otherwise stated
R802, 806	6-124D14	100k
R803	6-124C77	470k
R805	6-124D04	15k
R807, 809	6-125C25	180k
R808	6-124C37	100 ±1/2 W
R810, 811, 812	6-13755C64	330
R813	6-124A48	56, 2k ±1%
R814	6-124A45	910 ±5%
R815	6-124A49	680 ±5%
R816	6-124C43	1k ±5%
R817, 822, 824, 830	6-124C73	560
R818	6-124C35	10k
R819	6-124C83	27k
R821	6-124A59	2.7k
R823	6-124A57	2.2k ±5%
R825	6-13755C67	5620 ±1%
R826	6-10621C59	4640 ±1%
R827, 829	6-124C83	27k
R828	6-124B10	330k ±5%

TR801	51-84267A82	THERMISTOR:
TR802	51-84320A55	10k ohms @ 25°C

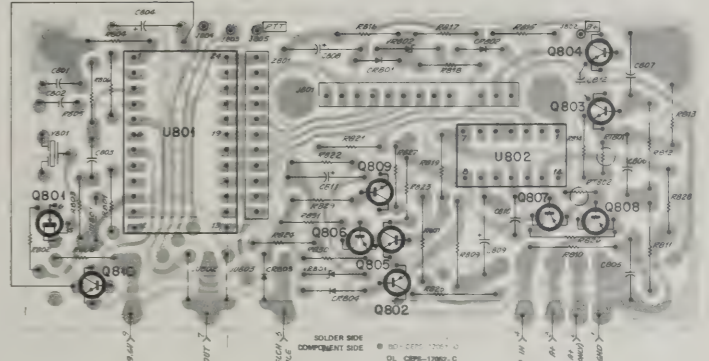
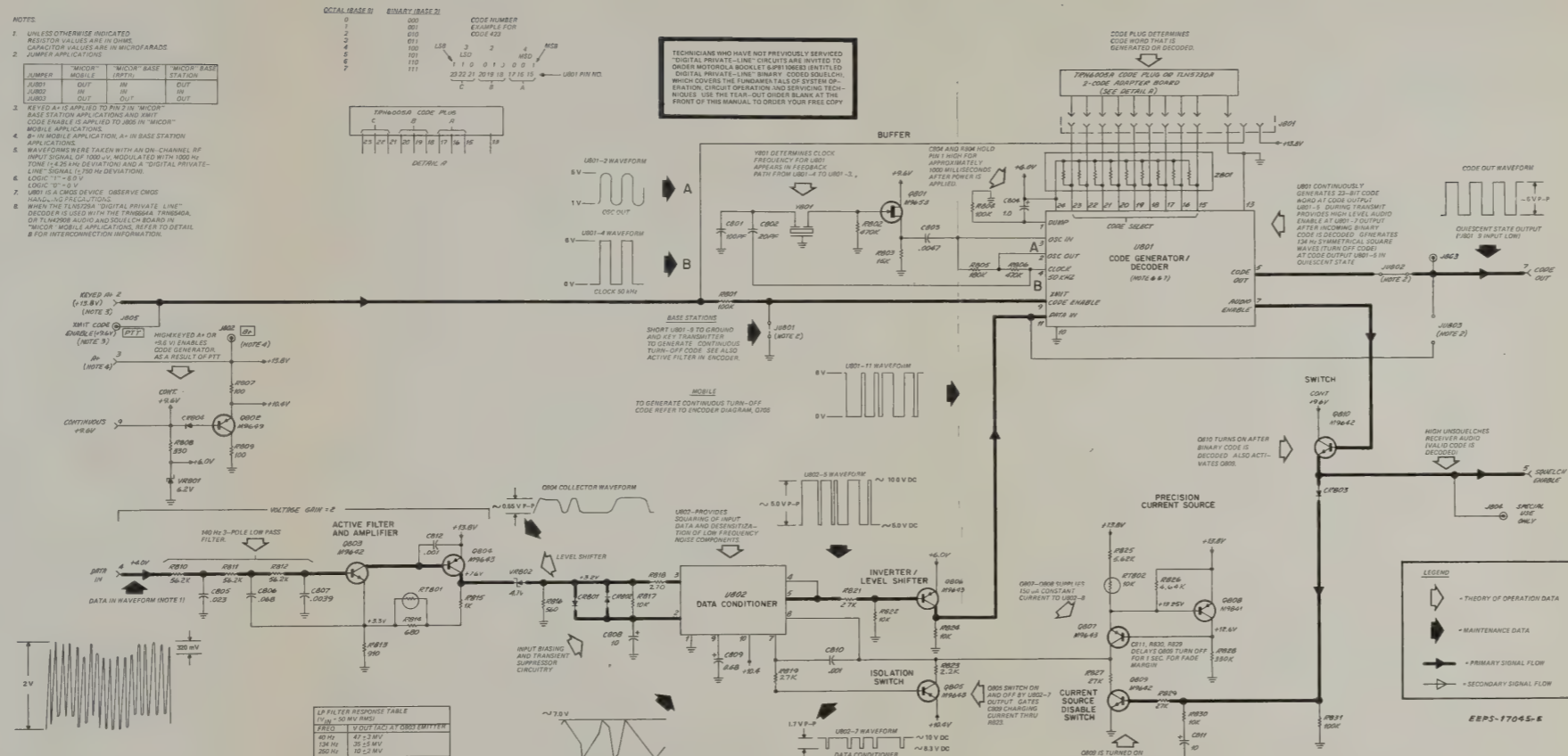
U801	51-84267A82	INTEGRATED CIRCUIT: (SEE NOTE)
U802	51-84320A55	M5782
		M2055

V801	48-83696E07	VOLTAGE REGULATOR:
V802	48-82256C03	Zener type; 6.2 V
		Zener type; 4.70 V

Y801	48-82003K01	CRYSTAL: resonator; 50,000 KC
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Z801	51-82142K02	RESISTOR NETWORK: pull-up, 10-pin
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		NOTE: For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part number.
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SHOWN FROM COMPONENT SIDE

TONE "PRIVATE-LINE" DECODER

MODEL TRN6002A

FUNCTION

Unsquels receiver upon receipt of proper "Private-Line" tone

RMS MEASURED UNDER FOLLOWING CONDITIONS:

VERTICAL SENSITIVITY SHOWN UNDER EACH WAVEFORM.
HORIZONTAL DEFLECTION = 5 msec/DIV.
RECEIVER OPERATING PROPERLY:

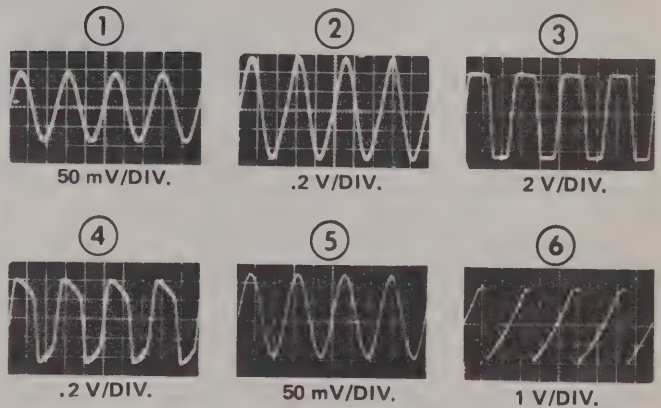
INJECT 1000 μ V RF CARRIER AT ANTENNA CONNECTOR.
MODULATE CARRIER WITH "PL" TONE. ADJUST MODULATION FOR WAVEFORM ①;
E.G. 60 mV rms (170 mV P-P) AT J201-2.

RECEIVER NOT USED:

INJECT "PL" TONE AT J201-2.
ADJUST TONE LEVEL FOR WAVEFORM ①.

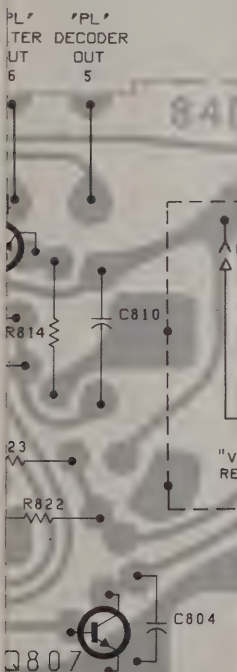
OSCILLOSCOPE VERTICAL INPUT -- AC.
OSCILLOSCOPE SYNC -- INTERNAL.
MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND.

"PL" DECODER WAVEFORMS



EPS-6182-B

CARRIER V



WAVEFORM FROM SOLDER

TONE "PRIVATE-LINE" DECODER

68P81026E73-G
5/10/79-PHI

HANDLING PRECAUTIONS FOR CMOS INTEGRATED CIRCUITS

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

- (1) Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.
- (2) Whenever possible avoid touching any electrically conductive parts of the circuit module with your hands.
- (3) Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.
- (4) When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.
- (5) All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.
- (6) If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through a resistance of approximately 100k.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

- (7) When soldering, be sure the soldering iron is grounded.
- (8) Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.
- (9) When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.
- (10) All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.
- (11) Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NONCONDUCTIVE MATERIAL for packaging these modules.

"DIGITAL PRIVATE-LINE" DECODER BOARD TROUBLESHOOTING CHART

NOTES:

1. To obtain a test code for the following procedure apply a carrier frequency signal to the receiver rf input from an rf signal generator modulated by the code output of a Motorola SLN6413A "Digital Private-Line" Test Set. Be sure the signal generator is able to accept very low frequency modulation (less than ± 5 Hz).
2. Before you replace U801, use the following procedure to verify that U801 is malfunctioning:
 - a. Connect U801-11 to the code input of a Motorola SLN6413A "Digital Private-Line" Test Set.
 - b. Apply a carrier-frequency signal to the receiver rf input from a signal generator that is modulated by the code output of the test set.If proper decode is indicated, U801 must be replaced. If U801 must be replaced, refer to the CMOS handling precautions.

SYMPTOM	PROBABLE CAUSE	ACTION
No decode, but received audio is good when PL is disabled.	1. Audio squelch is malfunctioning.	Remove the decoder board. Apply +9.6 V at P201-3 on audio & squelch board. If audio is not enabled, troubleshoot audio & squelch circuits.
	2. No 50 kHz clock	Check U801-4 for 50 kHz clock pulses. Rise time must be ≤ 750 n sec.
	3. Audio enable switch is malfunctioning.	If U801-7 is high, but circuit board pin 5 is low when receiving code, replace Q810.
	4. Dump pin U801-1 is always high.	Check U801-1 should always be 0 V.
	5. Wrong or bad code plug.	Replace with a known good code plug. Check U801-15 through U801-23 for proper octal code.
	6. No data into U801.	Check U801-11 for 0 - 6 V pulses. If pulses are not present, check Q806 and U802 operation.
	7. Transmit code enable input is high.	Ground U801-9. If a received code is properly decoded, check for a malfunction in the delayed transmit enable circuit on the encoder board.
	8. U801 has an internal malfunction.	If, after checking causes 1 through 7, the cause of the problem has not been isolated, replace U801. CAUTION U801 is a CMOS device and may be damaged by improper handling. Refer to the CMOS handling precautions in this instruction section.
Excessive decoder falsing when monitoring an inactive channel (noise falsing).	1. Precision current source is low or inoperative.	Measure the dc voltages in the precision current source circuits. Current to U801-8 = $(V_{BE} \text{ of Q808}) (R825 + R826 + RT802) / R826 (R825 + RT802)$

SYMPTOM	PROBABLE CAUSE	ACTION
	2. Current source disable switch is always on.	Check for 8 - 10 V at Q809 collector. If Q809 collector is 0 V, replace Q809.
	3. Improper 140 Hz low pass filter response.	Check dc voltages in filter circuit. Check the filter frequency response. Measured at Q803 emitter, the filter response should be -1.0 to -4.0 dB at 134 Hz and -12 to -15 dB at 250 Hz with 50 mV rms signal at decoder input.
	4. U802 supply voltage is too high.	Check U802-10 for +10.4 V ± 0.2 V dc. If voltage is high, troubleshoot the +10.4 V regulator on the decoder board.
	1. Turn-off code not being transmitted by other radio unit.	Monitor circuit board pin 4 (DATA IN) for presence of turn-off code at ends of transmissions.
Excessive squelch tails (approx. 500 msec noise burst) at ends of received transmissions	2. U802 lock-in malfunction	Ground Q809 collector. With a 300 mV p-p signal at circuit board pin 4 (DATA IN), the waveform at U802-4 should be locked in to the input signal up to at least 175 Hz. If proper lock-in does not occur, replace C809, then check lock-in again. If lock-in is still bad, replace U802.
	3. U801 turn-off code detector is malfunctioning.	Check U801 (Note 2).
	1. Improper 140 Hz low pass filter response response.	Check dc voltages in filter circuit. Check the filter frequency response; measured at Q803 emitter, the filter response should be -1.0 to -4.0 dB at 134 Hz and -12 to -15 dB at 250 Hz with 50 mV rms signal at decoder input.
Poor detector sensitivity in poor quieting conditions	2. Precision current source supplying too much current to U802-8.	Measure the dc voltages in the current source circuits. Current to U802-8 = $(V_{BE} \text{ of Q808}) (R825 + R826 + RT802) / R826 (R825 + RT802)$
	3. Current source disable switch inoperative.	While detecting a valid code, check Q809 collector for 0 V dc. If 8-10 V is present, replace Q809.
Occasional squelch tail about 1 second after the end of a transmission from another radio	Current source disable switch is staying on too long.	Check Q809 collector. Q809 collector should go from 0 V dc to 8-10 V within 1.5 seconds after loss of audio squelch disable.

EPS-17705-C

TECHNICAL CHARACTERISTICS	
FREQUENCY DETERMINING DEVICE	"Vibrasponder" resonant reed
PL TONE FREQUENCY	Selected from 67-210 Hz range
TONE ACCURACY	±0.15%
TONE BANDWIDTH	Approximately 1 Hz
TONE SENSITIVITY	0.25 volt ac rms reed drive
OUTPUT	9.5 volts dc switched
POWER REQUIREMENT	9.6 volts dc @15 milliamperes

1. DESCRIPTION

This decoder provides a dc output voltage to unsquench the receiver's audio section only when the proper PL tone is received. The decoder will respond only to a specific, continuous low-frequency tone from a transmitter in the same "Private-Line" network.

2. FUNCTIONAL OPERATION

2.1 GENERAL

2.1.1 "PL" Tone Present

2.1.1.1 The PL filter passes low frequency PL tones and attenuates signals above 300 Hz. The noise switch shorts out high frequency noise signals. The tone from the PL filter is limited to a fixed level by the amplifier/clipper and then applied to the "Vibrasponder" resonant reed which vibrates when the tone is the same frequency as the reed's resonant frequency. When the reed is vibrating, the tone is applied to a detector which develops a dc output which activates the output switch. When the output switch is activated, 9.5 volts is present at its output to enable the audio circuits. The output also activates the noise switch.

2.1.1.2 A separate-high pass audio filter is located on the PL decoder board which allows voice signals above 300 Hz to pass but blocks PL tones. This filter is connected in series with the audio signal path to prevent the PL tone from being heard in the speaker.

2.1.2 "PL" Tone Absent

When no PL tone is present, the output switch is off. The output voltage is 0 volts at this time which inhibits the squelch circuit to prevent an audio output to the speaker. The noise switch is off at this time which allows high frequency noise to bypass the PL filter. The presence of high frequency noise desensitizes the amplifiers and acts as an "anti-falsing" feature to prevent a random low-frequency noise signal from activating the resonant reed.

2.2 DECODER INPUT CIRCUITS

2.2.1 The receiver discriminator output signal consists of noise only when no carrier signal is being received. With a carrier signal input to the receiver, the noise is reduced and voice audio or voice audio and PL tone added.

2.2.2 These input signals are routed through the low pass filter and noise gate circuit. A receiver input signal that is modulated 40.05 kHz with PL tone produces a nominal 60 millivolt rms signal at the input to the decoder. The low pass filter consists of L801, C802, C803 and C805 attenuates sharply all signals above 300 Hz. Thus, voice and noise signals above 300 Hz are blocked,

but PL tones are passed. High pass filter C801, R803, and C807 presents a parallel path for high frequency noise whenever the decoder is not activated. This condition is desirable so that low frequency noise (only) will not falsely activate the decoder. When the proper tone has been received and the decoder is activated, noise switch Q807 acts as a short and grounds all high frequency signals before they reach amplifier Q801.

2.3 INPUT AMPLIFIER CIRCUITS

Amplifier Q801 amplifies noise and PL tone signals which are coupled to amplifier/clipper Q702. Diode CR801 and the base emitter junction of Q802 limit both the positive and negative swing of the signal to a maximum amplitude. The amplified output of Q802 provides a constant amount of drive even though the amount of PL tone deviation from various transmitters is not constant. It also limits the noise signals to prevent oversensitivity to noise signals which could falsely operate the "Vibrasponder" resonant reed. "Vibrasponder" driver Q803 operates as an emitter follower to provide current drive to the low impedance "Vibrasponder" resonant reed.

2.4 "VIBRASPONDER" RESONANT REED

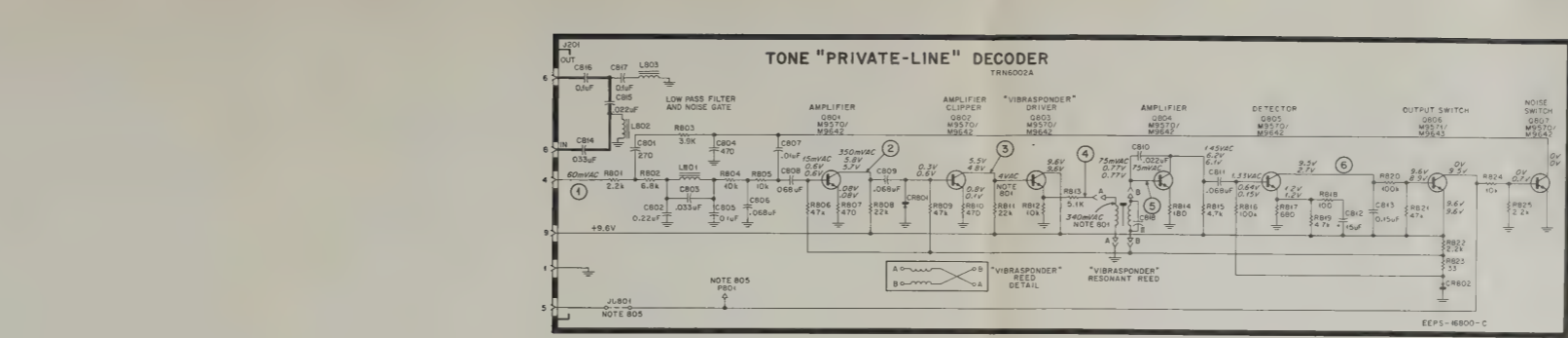
At resonance, the reed acts as a high Q transformer coupling energy from the primary to the secondary winding. At all other frequencies, the reed will not vibrate and no energy is coupled to the secondary winding.

2.5 OUTPUT CIRCUIT

When the proper PL tone is applied to the reed, it develops a sinusoidal wave output at its resonant frequency. This sinusoidal wave is amplified by Q804. Negative feedback through C810 maintains the sinusoidal waveform. The amplified signal is sent to detector Q805 which converts the signal to a dc potential. Q805 is cut off with its collector voltage of 9.6 volts until the tone is applied. With tone applied, the positive most portion of the sinusoidal wave is clamped at approximately .6 volt. The positive swing of each cycle causes momentary conduction of Q805 and the collector voltage drops to near zero volts. C813 charges during the conduction period and discharges through R820 and R821 to develop a filtered dc potential which forward biases output switch Q806. With Q806 activated, 9.6 volts is gated to the output which unsquenchs the receiver. Noise switch Q807 is also activated which places a short across the noise gate as explained in paragraph (b).

2.6 AUDIO FILTER

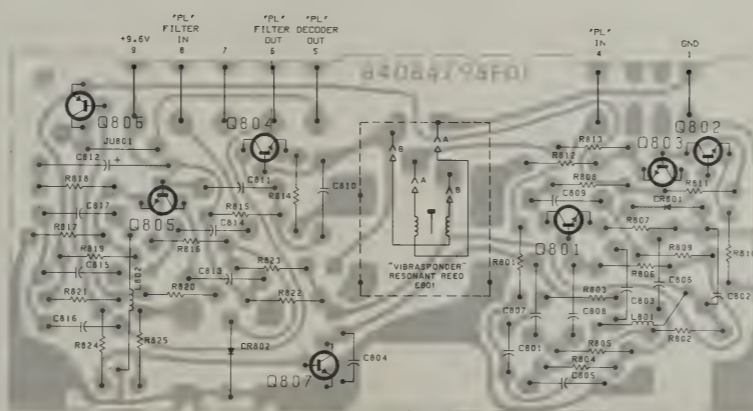
Audio and PL tone from the VOLUME control are routed through an audio filter consisting of C814-C817 and L802 and L803. The filter is electrically separate from the decoder but physically mounted on the same board. This filter is high-pass type which blocks the PL tone and passes the audio to the audio & squelch board.



NOTES:
801. DUE TO SQUARE WAVE CHARACTERISTIC SOME METERS RESPOND DIFFERENTLY. VOLTAGE SHOULD BE MEASURED WITH AN OSCILLOSCOPE.
802. AC VOLTAGE READINGS ARE RMS VALUES WITH 60 MILLIVOLTS "PL" TONE INPUT. USE HIGH IMPEDANCE (10 MEGOHM) AC VOLTMETER. MEASUREMENT MADE WITH RESPECT TO CHASSIS GROUND.
803. DC VOLTAGE READINGS TAKEN WITH HIGH IMPEDANCE 1H MEGOHM DC VOLTMETER. TOP VALUE IS MEASURED WITHOUT "PL" TONE. BOTTOM VALUE IS

MEASURED WITH 60 MILLIVOLTS "PL" TONE INPUT. MEASUREMENT MADE WITH RESPECT TO CHASSIS GROUND.
804. UNLESS OTHERWISE STATED: RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN PICOHARADS.
805. JUMPER J801 AND P801 ARE INCORPORATED IN MODEL TRN6002A ONLY. J801 IS REMOVED AND P801 IS USED ONLY FOR CERTAIN OPTIONAL EQUIPMENT.

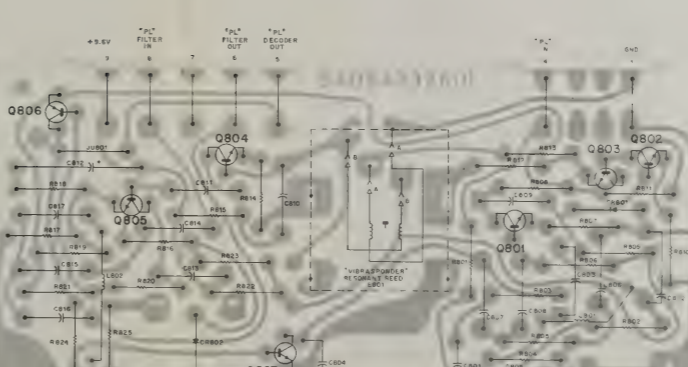
EARLIER VERSION



SHOWN FROM SOLDER SIDE

8D-CEPS-16801-A
DL-CEPS-16802-B

LATER VERSION



SHOWN FROM SOLDER SIDE

8E-CEPS-21107-D
DL-CEPS-21108-E

TONE "PRIVATE-LINE" DECODER

MODEL TRN6002A

FUNCTION

Unsquenches receiver upon receipt of proper "Private-Line" tone

WAVEFORMS MEASURED UNDER FOLLOWING CONDITIONS

- 1 VERTICAL SENSITIVITY SHOWN UNDER EACH WAVEFORM
- 2 HORIZONTAL DEFLECTION = 5 msec/DIV
- 3 WITH RECEIVER OPERATING PROPERLY

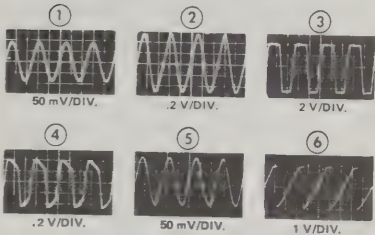
- A INJECT 1000 UV RF CARRIER AT ANTENNA CONNECTOR
- B MODULATE CARRIER WITH "PL" TONE. ADJUST MODULATION FOR WAVEFORM ① I.E. 80 mV rms (170 mV P-P) AT J201-2

- 4 RECEIVER NOT USED

- A INJECT "PL" TONE AT J201-2
- B ADJUST TONE LEVEL FOR WAVEFORM ①

EPS-6182-B

"PL" DECODER WAVEFORMS



68P81026E73-G
5/10/79-PHI

RECEIVER SHIELD

TLN1435B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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RDWARE KIT

PARTS LIST

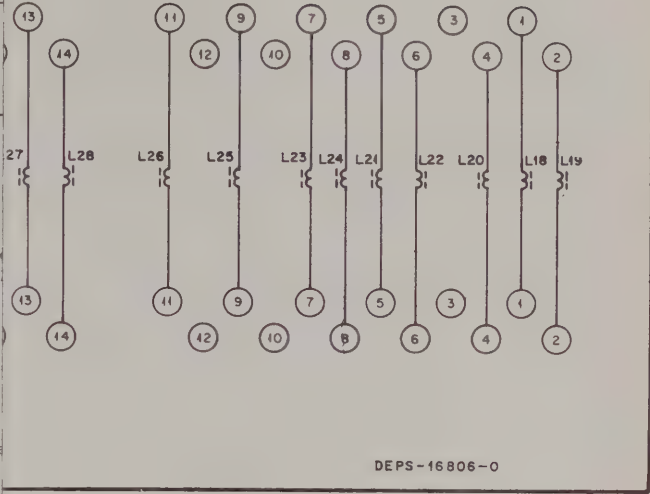
EPS-21031-O

TLN4740B Board & Panel Kit (p/o TLN1435B) PL-3285-

C33 thru 82	21-82543H01	CAPACITOR, fixed: 1500 pF ±20%; 500 V; coded YEL-VIO-BRN
C83, 84	21-82543H05	470 pF ±20%(YEL-VIO-BRN) COIL, RF: choke;
L18, 19, 21, 22, 23, 24, 36, 37, 40, 41 L20, 25 thru 35, 38, 39, 42, 43	24-83977B01 24-83961B01	1-1/2 turns thru ferrite block 3 turns over ferrite bead; coded BRN

TLN4738A Filter Chassis and Hardware Kit PL-3547-0

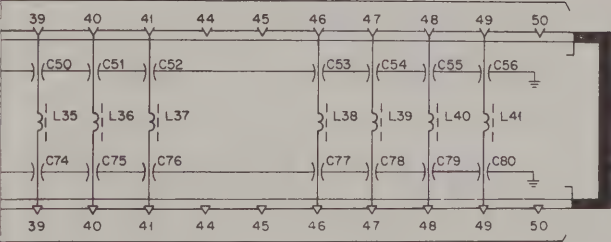
43-83281F01 27-84171D01 15-84169D01 14-84173D01 4-8412 4-7607 3-134168 3-134309 3-114834 2-9627 3-15728A24 32-84410D01 42-84431D01 42-84431D02	BUSHING; 2 req'd. CHASSIS, filter COVER, filter INSULATOR, filter cable LOCKWASHER #4 split; 10 req'd. WASHER, flat .125-.281 x .04 req'd. SCREW, tapping 4-40 x 1/4", Phillips; 2 req'd. SCREW, tapping 4-40 x 3/16" Phillips; 12 req'd. SCREW, machine 4-40 x 1"; 2 req'd. NUT, 4-40 x 3/16" x 3/32" Hd 8 req'd. SCREW, machine; 4-40 x 5/8" 6 req'd. SHIM, silicon, rubber; 4 req'd. CLAMP, flat wire CLAMP, flat wire
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REVISIONS

EPS-25E14

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1435B (TLN4740B-1)	C33 THRU C82	FROM 21-82543H01 1500 pF; ±20%, 500 V CODED YEL-VIO-BRN TO 21-82543H01; 1500 pF +100-0%; 500 V CODED BRN-GRN-RED	PARTS LIST
	C83, 84	FROM 21-82543H01 1500 pF; ±20%, 500 V CODED YEL-VIO-BRN TO 21-82543H05; 470 pF; ±20%; 500 V; CODED YEL-VIO-BRN	



EEPS-16805-A

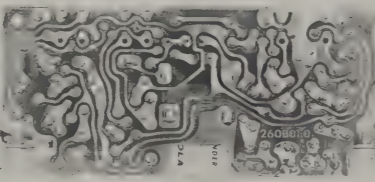
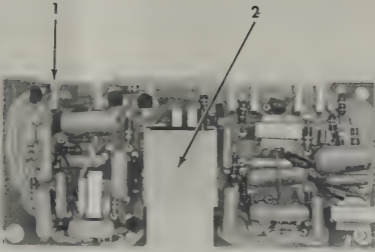
service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

RECEIVER SHIELD

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

ELECTRICAL PARTS LIST

IMPORTANT		
USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS		
TRN6002A Tone "Private-Line" Decoder	PL-3259-C	
		CAPACITOR, fixed: $\mu\text{F} \pm 10\%$; 50 V, unless otherwise stated
21-82187B38		270 pF
8-82905G32		0.22
8-82905G08		.033; 100 V
21-82187B39		470pF, 500 V
8-83813H06		0.1; 100 V
8-82905G04		.068; 100 V
8-82905G01		.01
8-82905G04		.068; 100 V
8-82905G02		.022
8-82905G04		.068; 100 V
23-83214C02		.022; 25 V
8-83214C10		.033; .5%
8-83813H06		.022 $\pm 5\%$
8-82905G30		0.1
8-82905G14		0.1 $\pm 5\%$; 200 V
21-83406D51		3 pF ± 0.25 pF; 500 V
48-83654H01		DIODE; (SEE NOTE 1)
		silicon
TLN8381A		VIBRASPONDER, RESONANT REED; (SEE NOTE 1)
		plug-in unit
24-84003A01		COIL, RF; choke
		6 H
48-869642		TRANSISTOR; (SEE NOTE 1)
48-869570		NPN; M9642
48-869643		PNP; M9643
48-869571		PNP; M9571
48-869642		NPN; M9642
48-869570		NPN; M9570
		RESISTOR, fixed: $\pm 5\%$; 1/4 W; unless otherwise stated
6-124C57		2.2k $\pm 10\%$
6-124C69		0.8k $\pm 10\%$
6-124A63		3.9k
6-124C73		10k $\pm 10\%$
6-124A89		47k
6-124A41		470
6-124A81		22k
6-124A89		47k
6-124A41		470
6-124A81		22k
6-124C73		10k $\pm 10\%$
6-124A66		5.1k
6-124A31		180
6-124A65		4.7k
6-124A97		100k
6-124A35		680
6-124C25		100 $\pm 10\%$
6-124A65		4.7k
6-124A97		100k
6-124A35		680
6-124A57		2.2k
6-124A13		1k
6-124C73		10k $\pm 10\%$
6-124C57		2.2k $\pm 10\%$



AEPS-6 105-O

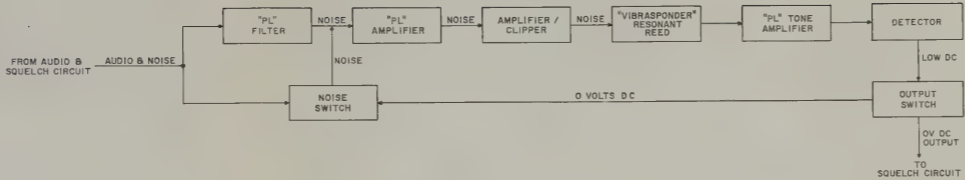
MECHANICAL PARTS LIST

TRN6002A Tone "Private-Line" Decoder		
ITEM	MOTOROLA PART NO.	DESCRIPTION
1	9-83011H01	TERMINAL, pin; female;
2	42-84116B01	6 req'd.
3	3-136905	SOCKET & CLAMP ASSY
		SCREW, lock: No. 4 x 5/16";
		2 req'd.
4	42-84284B01	RETAINER, Nylon: 2 req'd.
5	7-84223B01	BRACKET, retainer

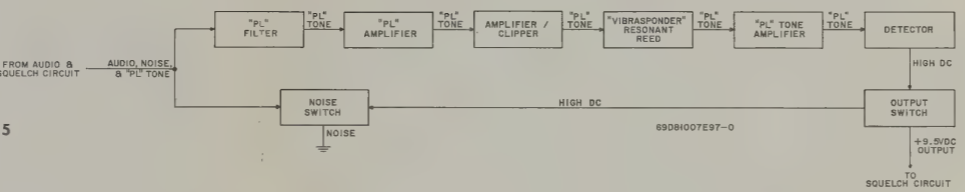
NOTES:

- For optimum performance, replacement diodes and transistors must be ordered by Motorola part number.
- The "Vibrasponder" Resonant Reed (Model TLN8381A) is not part of the decoder board. When ordering the complete board, the reed must be ordered separately.

"PL" TONE ABSENT



"PL" TONE PRESENT



REVISIONS

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6002A	CR04	FROM 21-82187B25 .001 μF $\pm 10\%$; 100 V TO 21-82187B39 470 pF $\pm 10\%$; 500 V	CR01 BASE
	RR03	FROM 6-124C73 10k $\pm 10\%$; 1/4 W TO 6-124A63 3.9k $\pm 5\%$; 1/4 W	
	RR13	FROM 6-124A65 4.7k $\pm 5\%$; 1/4 W TO 6-124A66 5.1k $\pm 5\%$; 1/4 W	CR03 EMIT-TER

MAINTENANCE

a. Recommended Test Equipment

- Motorola R1010 Series RF Signal Generator. This solid-state unit provides receiver rf carrier signals.

- Motorola SLN6221A "PL" Tone Generator and "Vibrasender" resonant reed on the same frequency as the "Vibrasponder" resonant reed of the decoder. An audio signal generator may be used if it is accurately set to the decoder frequency. However, to obtain the accuracy necessary, the frequency should be adjusted while the signal is measured on a frequency counter.

- Motorola Solid-State Oscilloscope for tone signal measurement. Some measurements may be taken with a high impedance ac voltmeter.

- Motorola Solid-State DC Multimeter for dc voltage measurements.

b. Performance Tests

- A 0.25 microvolt rf carrier signal modulated ± 0.5 kHz with PL tone should unsquelch the receiver. This can be checked as follows:

- Connect the rf signal generator to the receiver rf input receptacle. Set the signal generator to the receiver carrier frequency, then set the output to minimum.

- Modulate the signal generator output ± 0.5 kHz with a PL tone of the frequency stamped on the "Vibrasponder" resonant reed. The tone can be generated with a Motorola SLN6221A "PL" Tone Generator and a "Vibrasponder" resonant reed. The "Vibrasender" reed from the PL encoder may be used if it is the proper frequency.

- Also modulate the signal generator with an audio tone in the 300 to 3000 Hz range at ± 3.3 kHz.

- Increase the output of the signal generator until the receiver unsquelches and the audio tone is heard on the speaker. No more than 0.25 microvolt should be required to unsquelch the receiver.

c. Troubleshooting

- If the PL decoder does not operate, or operates improperly, the following hints may be helpful in locating the malfunction.

- Testing the "Vibrasponder" Resonant Reed

- One of the first tests should be a check of the "Vibrasponder" resonant reed. Inject a 340 millivolt rms PL tone of the proper frequency directly to the primary of the reed. Use an oscilloscope or ac voltmeter to check the output across the secondary of the reed. Approximately 75 millivolts rms should be measured. If the reed is good, continue with other decoder tests.

- Decoder Testing

- To test the decoder, inject a 1000 microvolt carrier signal into the receiver. Adjust PL modulation for 60 millivolts rms tone signal at the input to the decoder (test point 1 on the schematic diagram and circuit board detail). If the PL tone is injected directly into the decoder for testing, an rf carrier signal should be injected into the receiver to quiet the receiver noise. Otherwise, noise and PL tone will both be present and will produce erroneous readings.

- With 60 millivolts PL tone input, measure signal and dc voltages at various points in the decoder to isolate the trouble. Typical values for a normally operating decoder are given on the schematic diagram. Some waveforms are not sinusoidal and should be measured with an oscilloscope. Most ac voltmeters are calibrated to read accurately only for sinusoidal signals.

- If under normal operating conditions, the PL tones are heard with the speaker audio, the high pass filter on the decoder board should be checked.

NOTE

- The "PL" decoder can be removed from its normal position in the receiver chassis and plugged on the front or circuitry side of the audio board. Parallel-connected pins have been provided for ease of servicing. Remove the audio board shield for access to these pins.

TLN1435B MODEL COMPLEMENT		
MODEL	SUFFIX	DESCRIPTION
TLN4738A		FILTER CHASSIS & HARDWARE KIT
TLN4740B		BOARD & PANEL KIT

RECEIVER SHIELD

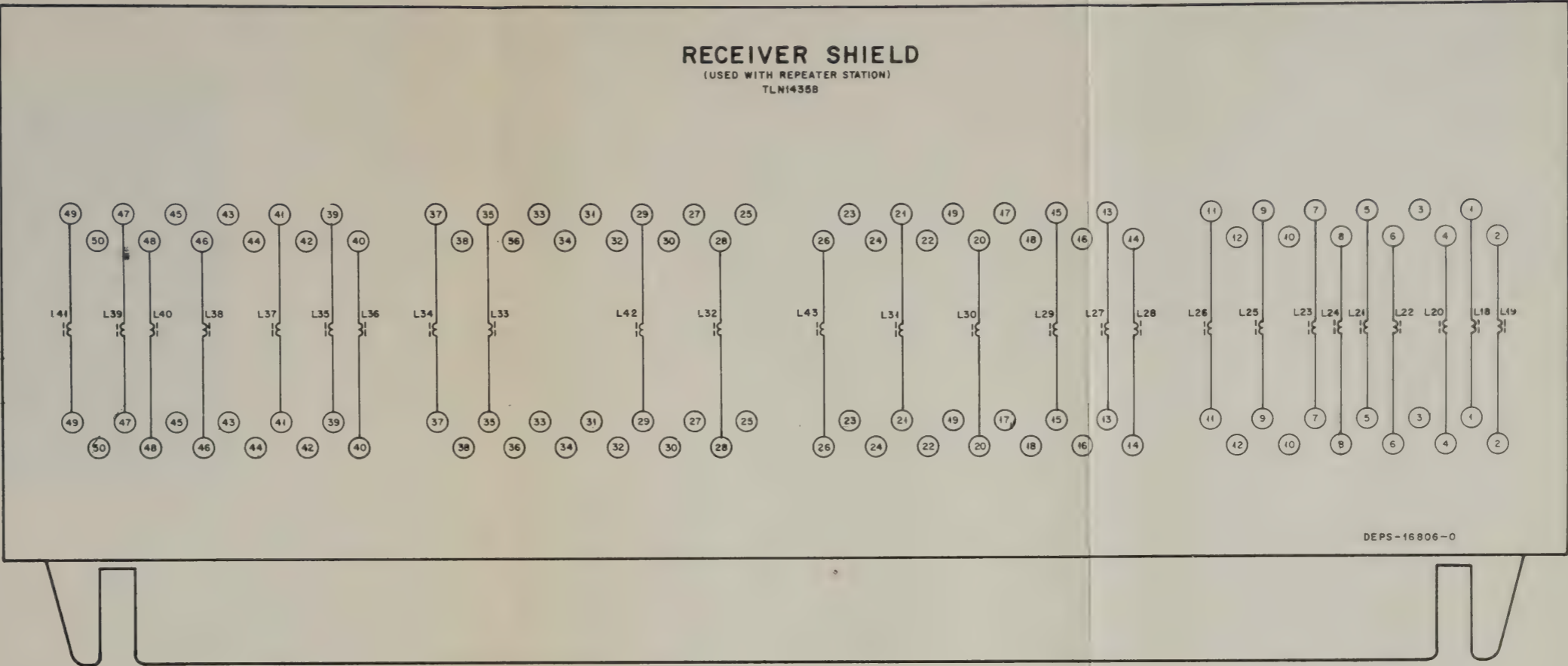
TLN1435B

EPS-21031-O

PARTS LIST

TLN4740B Board & Panel Kit (p/o TLN1435B) PL-3285-B		
C33 thru 82	21-82543H01	CAPACITOR, fixed; 1500 pF ±20%; 500 V; coded YEL-VIO-BRN
C83, 84	21-82543H05	470 pF ±20%(YEL-VIO-BRN) COLL, RF; choke;
L18, 19, 21, 22, 23, 24, 36, 37, 40, 41	24-83977B01	1-1/2 turns thru ferrite block
L20, 25 thru 35, 38, 39, 42, 43	24-83961B01	3 turns over ferrite bead; coded BRN

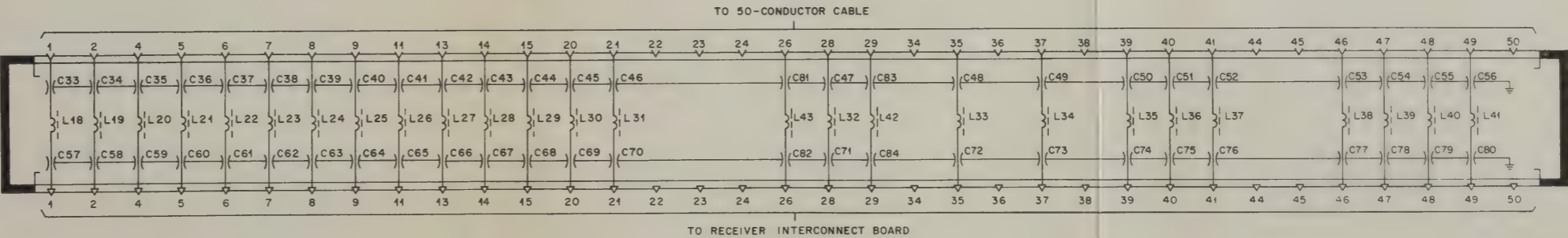
TLN4738A Filter Chassis and Hardware Kit PL-3547-0		
43-83281F01		BUSHING; 2 req'd.
27-84171D01		CHASSIS, filter
15-84169D01		COVER, filter
14-84173D01		INSULATOR, filter cable
4-8412		LOCKWASHER #4 split; 10 req'd.
4-7607		WASHER, flat .125-.281 x .027"
3-134168		SCREW, tapping 4-40 x 1/4", Phillips; 2 req'd.
3-134309		SCREW, tapping 4-40 x 3/16", Phillips; 12 req'd.
3-114834		SCREW, machine 4-40 x 1"; 2 req'd.
2-9627		NUT, 4-40 x 3/16" x 3/32" Hex; 8 req'd.
3-15728A24		SCREW, machine; 4-40 x 5/8"; 6 req'd.
32-84410D01		SHIM, silicon, rubber; 4 req'd.
42-84431D01		CLAMP, flat wire
42-84431D02		CLAMP, flat wire



DEPS-16806-O

REVISIONS

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1435B (TLN4740B-1)	C33 THRU C82	FROM 21-82543H01 1500 pF; ±20%, 500 V CODED YEL-VIO-BRN TO 21-82543H01; 1500 pF ±100-0%; 500 V CODED BRN-GRN-RED	PARTS LIST
	C83, 84	FROM 21-82543H01 1500 pF; ±20%, 500 V CODED YEL-VIO-BRN TO 21-82543H05; 470 pF; ±20%; 500 V; CODED YEL-VIO-BRN	



RECEIVER SHIELD

TLN1435B
(USED WITH REPEATER MODELS ONLY)
ALL CAPACITOR VALUES ARE 1500 pF

EEPS-16805-A



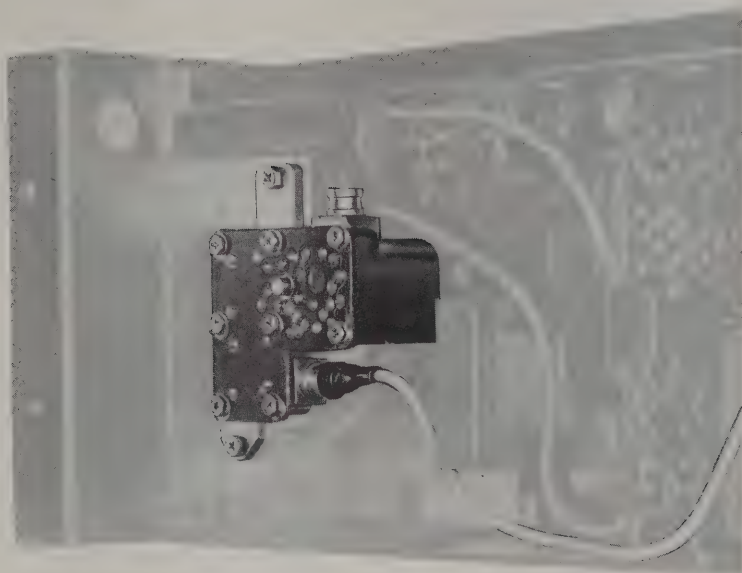
service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

RF PREAMPLIFIER

MODELS TLD8421B AND TLD8422B

& CABLE

MODEL TKN6613A



AEPS-8824-O

MODEL	FREQUENCY
TLD8421B	132-150.8 MHz
TLD8422B	150.8-174 MHz

TECHNICAL CHARACTERISTICS

IMPEDANCE	50 ohm input, 50 ohm output
CURRENT DRAIN	20 mA at 13.8V
FREQUENCY	132-174 MHz
POWER GAIN	10 dB

RECEIVER WITH PREAMPLIFIER

SENSITIVITY	-20 DB QUIETING	0.25 uV
	EIA SINAD	0.175 uV
SELECTIVITY (EIA SINAD)		-95 dB at ± 30 kHz
INTERMODULATION (EIA SINAD)		-75 dB
SPURIOUS AND IMAGE REJECTION		-95 dB minimum
SQUELCH SENSITIVITY		Threshold 0.1 uV max. at 6 dB max. quieting
		Tight 0.6 uV max. at 14 dB min. quieting



MOTOROLA INC.

SERVICE PUBLICATIONS

1301 E. ALGONQUIN ROAD

Communications Division

SCHAUMBURG, ILLINOIS 60172

RF PREAMPLIFIER

MODELS TLD8421B AND TLD8422B

& CABLE

MODEL TKN6613A



AEPS-8824-O

MODEL	FREQUENCY
TLD8421B	132-150.8 MHz
TLD8422B	150.8-174 MHz

TECHNICAL CHARACTERISTICS

IMPEDANCE	50 ohm input, 50 ohm output
CURRENT DRAIN	20 mA at 13.8V
FREQUENCY	132-174 MHz
POWER GAIN	10 dB

RECEIVER WITH PREAMPLIFIER

SENSITIVITY	-20 DB QUIETING	0.25 uV
	EIA SINAD	0.175 uV
SELECTIVITY (EIA SINAD)		-95 dB at ± 30 kHz
INTERMODULATION (EIA SINAD)		-75 dB
SPURIOUS AND IMAGE REJECTION		-95 dB minimum
SQUELCH SENSITIVITY		Threshold 0.1 uV max. at 6 dB max. quieting
		Tight 0.6 uV max. at 14 dB min. quieting



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Communications Division

SCHAUMBURG, ILLINOIS 60172

RF PREAMPLIFIER & CABLE

1. DESCRIPTION

The rf preamplifier is an optional accessory item that increases the input signal level to the receiver thereby increasing its operating range. Using the rf preamplifier in two-receiver stations results in an increase greater than 3dB in input signal level to both receivers. (In stations using two receivers, the input signal level, without preamplifier, to each receiver is reduced by 3dB as compared to one-receiver stations. Two-receiver stations also require the use of the optional two-receiver coupler).

The preamplifier kit includes a printed circuit board, a housing and a coaxial cable with rf phono-type connectors. The circuit board is plated on both sides with components mounted toward the inside of the housing. The preamplifier circuit consists of two aperture-coupled helical resonators, an FET amplifier, and an output coil.

NOTE

The rf preamplifier is capable of amplifying two or more input carrier frequencies providing that the maximum center frequency separation does not exceed 1.5 MHz. If carrier frequency separation does exceed 1.5 MHz, two rf preamplifiers are required.

2. OPERATION

The incoming rf signal is applied to the preamplifier input jack J1 through the receiver input cable. The input jack is connected to a tap on coil L1. The rf signal is coupled from L1 to L2 by utilizing the cavities in the housing to form two aperture-coupled helical resonator cells. The tapped output of L2 is applied to common-gate FET amplifier Q1 through rf bypass capacitor C6. Resistor R2 develops dc bias. Output coil L3 provides loading for Q1 and is capacitively matched by capacitor C4 to output jack J2. This provides a 50-ohm termination for the input of the rf preselector.

3. MAINTENANCE

a. General

This section provides the maintenance shop type procedures for the rf preamplifier.

These bench tests include measurements with a Motorola portable test set, and procedures for testing and troubleshooting.

b. Alignment

NOTE

If the preamplifier is normally operated with more than one carrier frequency input, determine the center of the preamplifiers operating range and, if possible, use this frequency to perform the alignment. If this is not possible, align the preamplifier using the lowest carrier frequency.

Disconnect the preamplifier input and output cables and bypass the preamplifier by connecting the receiver input cable directly to the rf preselector input. Check and align the preselector according to the alignment procedure described in the receiver section of the manual. After the receiver has been aligned, disconnect the receiver input cable from the preselector and reconnect the preamplifier input and output cables. While monitoring position 5, align the preamplifier for maximum meter indication by adjusting the tuning coils in the following order; L3, L2, L1. For final tuning, repeak L3, L2, and L1; then tune L2 for maximum quieting.

c. Realignment

It is not necessary to bypass the preamplifier when aligning to the same frequency or to a new frequency if it is within ± 1.0 MHz of the previously tuned frequency. Align the rf preselector first, then adjust the preamplifier as described in the preceding paragraph.

d. Troubleshooting

With the preamplifier connected, and the test set on position 5, perform the following:

(1) Increase the signal generator output for a maximum indication on the test set meter (saturation), then decrease until a convenient reference point is reached on the test set meter (not more than 10 uA below the saturation point). Note both the test set meter indication and the signal generator output level setting.

(2) Disconnect the preamplifier input and output cables and bypass the preamplifier by connecting the receiver input cable directly to the rf preselector input.

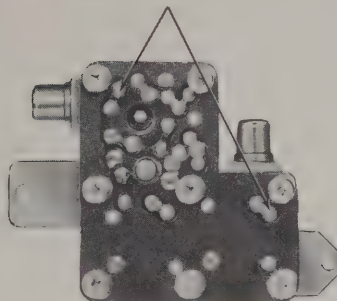
(3) Increase the signal generator output until the same reference point is obtained on the test set meter. Note the signal generator output level setting, it should be at least 3 times greater than the previous setting for a preamplifier gain of approximately 9-1/2 dB.

(4) Reconnect the preamplifier and check the alignment if the above indications are not obtained.

(5) If there is no output or insufficient gain after the preamplifier is aligned, check for faulty components or solder connections on the printed circuit board (refer to the circuit board removal and replacement illustration).

REMOVAL PROCEDURE

1. THOROUGHLY REMOVE SOLDER FROM INPUT AND OUTPUT FEEDTHRU LEADS.



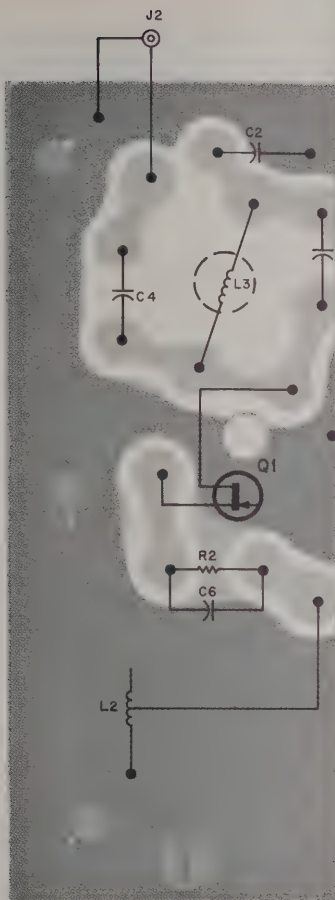
AEPS-8815-O

2. REMOVE 8 SCREWS AND LIFT OFF CIRCUIT BOARD.

REPLACEMENT PROCEDURE

3. REPLACE BOARD AND SECURE WITH SCREWS.
4. RESOLDER INPUT AND OUTPUT FEEDTHRU LEADS.

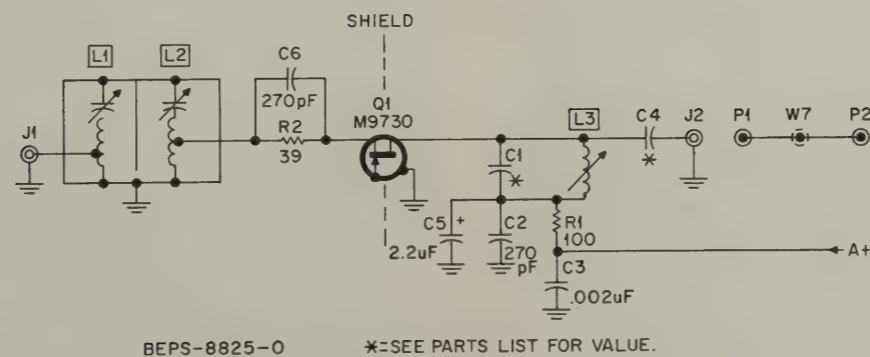
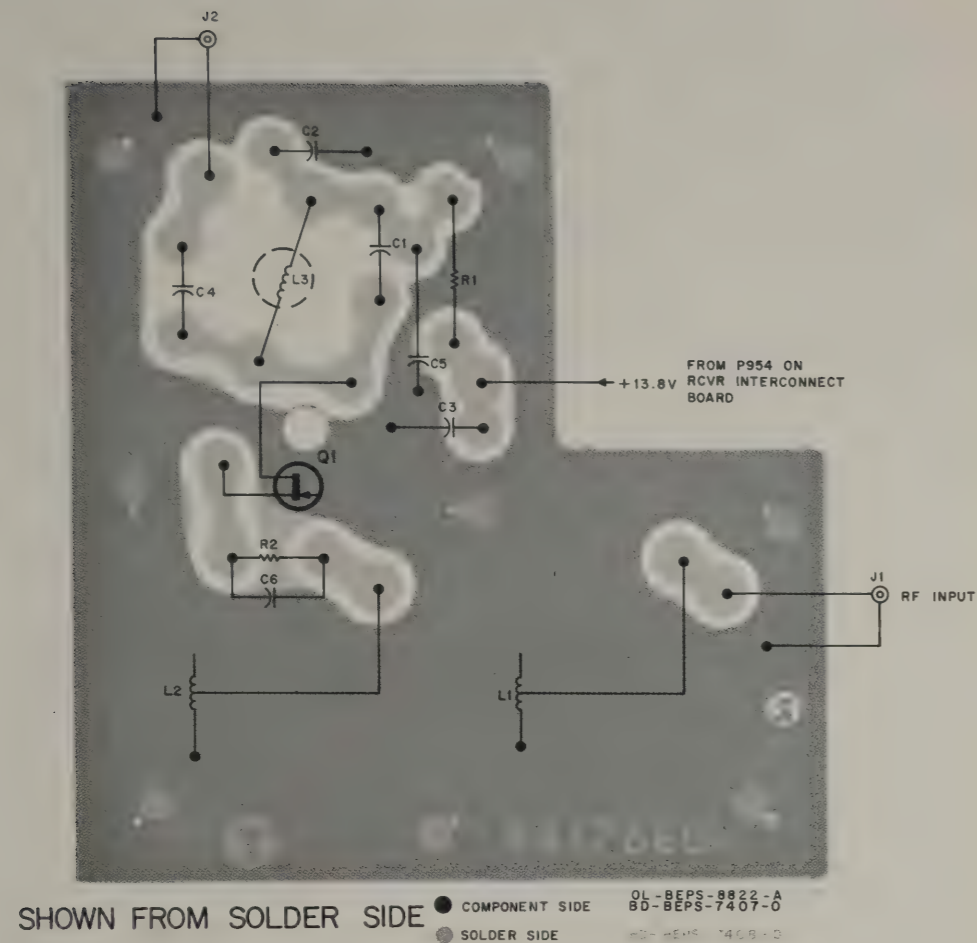
Preamplifier Circuit Board Removal and Replacement



SHOWN FROM SOLDER SIDE

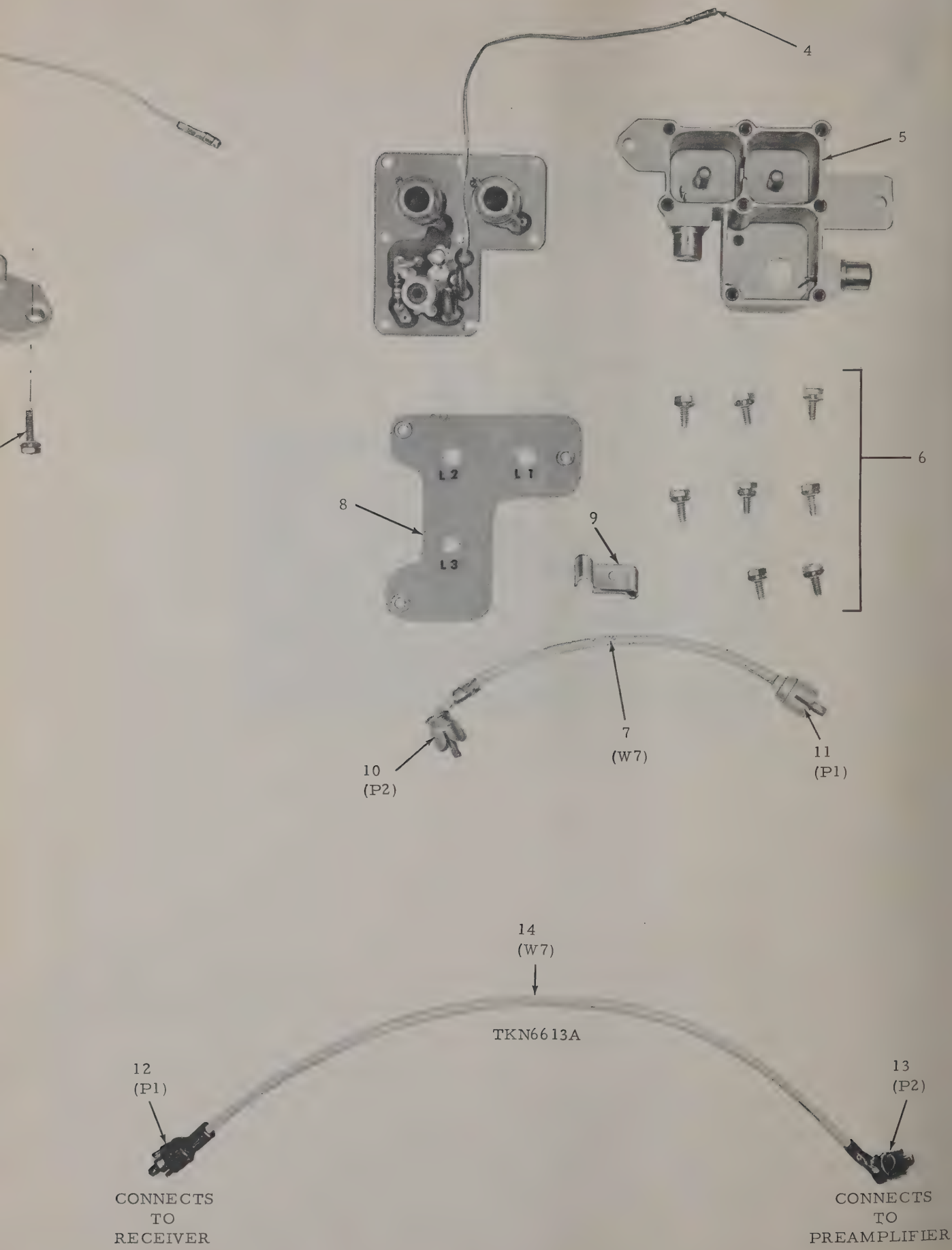
PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Receiver RF Preamplifier & Cable
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81013E34-A
6/20/80-PHI



BEPS-8825-0

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
Receiver RF Preamplifier & Cable
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81013E34-A
6/20/80-PHI



2-RECEIVER COUPLER

MODEL TLN4758A



AEPS-9070-O

1. ELECTRICAL DESCRIPTION

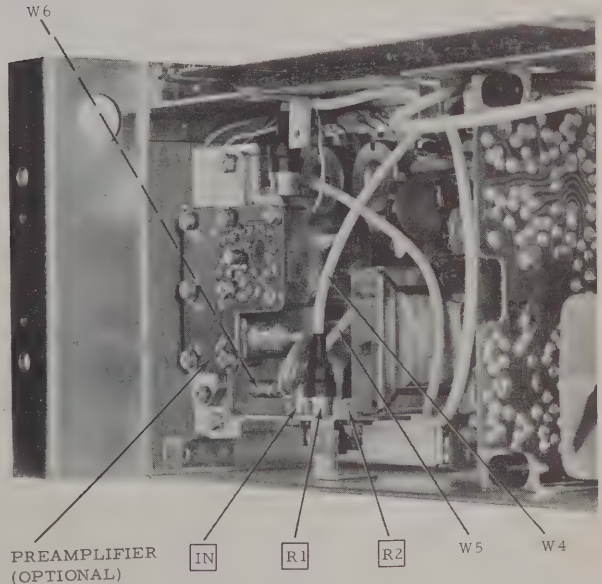
This unit allows two receivers to operate from a single antenna source without interaction. It provides a correct impedance match between both receivers and the antenna source, and also provides isolation between the two receivers. Signal coupling and impedance matching is accomplished by utilizing two transformers and a resistor. A capacitor in the coupler partially cancels the circuit inductance and thereby makes the circuit appear resistive.

2. PHYSICAL DESCRIPTION

The 2-receiver coupler, consisting of a bracket which mounts the electrical components and three cables, is designed to mount in the first receiver chassis. When the coupler is used, the input to the receiver is disconnected and reconnected to

the IN connector on the coupler. (If the receiver chassis contains a preamplifier, the output of this module is connected to the IN connector on the coupler.) Coupler cable W4 connects between the R1 coupler connector and the receiver module input connector. One end of coupler cable W5 is bulkhead-mounted in the rear receiver chassis wall and the other end of cable W5 mates with R2 coupler connector. Coupler cable W6 connects between the bulkhead-mounted connector on cable W5 and the input on the second receiver chassis.

On two-receiver stations with wide separation between frequencies and using the optional preamplifiers, a separate preamplifier is used with each receiver and the antenna coupler connects between the antenna source and the preamplifiers.



AEPS-9071-O

2-RECEIVER COUPLER

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Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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ELECTRICAL PARTS LIST

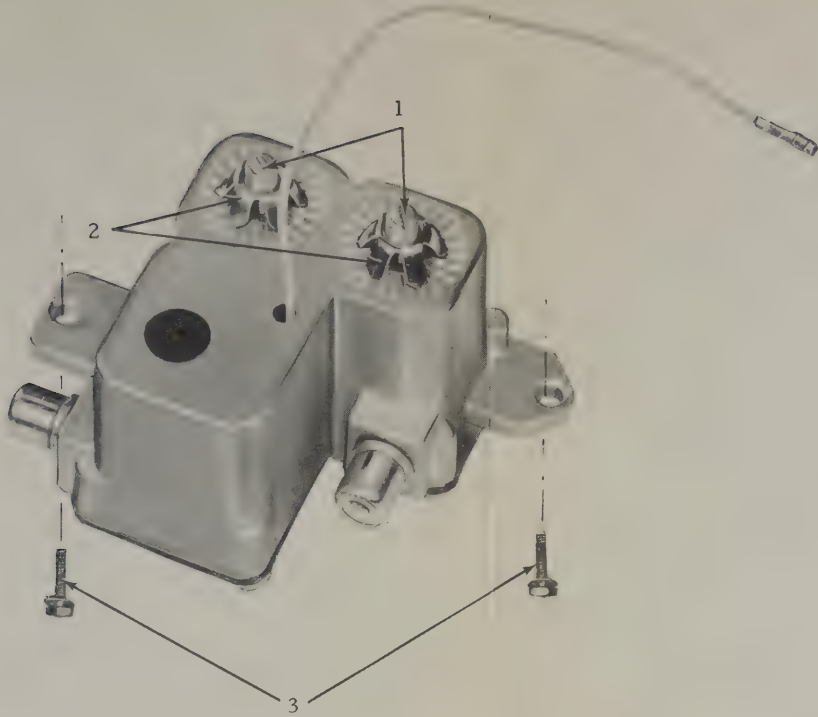
LEGEND:
L = 132-150.8 MHz
H = 150.8-174 MHz

TLD8421B RF Preamplifier (132-150.8 MHz)
TLD8422B RF Preamplifier (150.8-174 MHz) PL-1474-B

C1L	21-82133G40	CAPACITOR, fixed: 3.9 pF ±0.25 pF; 500 V; NP0
C1H	21-83406D52	2 pF ±0.25 pF; 500 V; NP0
C2	21-82187B04	270 pF ±10%; 500 V
C3	21-83596E14	.002 uF ±10%; 200 V
C4L	21-83406D52	2 pF ±0.25 pF; 500 V; NP0
C4H	21-868487	1.5 ±0.25 pF; 500 V; NP0
C5	23-84762H04	2.2 uF ±20%; 25 V
C6	21-82187B04	270 pF ±10%; 500 V
J1, 2	9-84135B02	CONNECTOR, receptacle: female; coaxial; miniature type
L1L	24-84418C01	COIL, RF: tapped; coded BRN
L1H	24-84421B01	tapped; (not coded)
L2L	24-84418C02	tapped; coded RED
L2H	24-84421B02	tapped; coded YEL
L3	24-84422B01	(not coded)
P1	28-82331G01	CONNECTOR, plug: male, coaxial; miniature type
P2	28-82365D03	male, coaxial, right angle
P3	39-10184A24	female; single-contact (wire terminal)
Q1	48-869730	TRANSISTOR: (SEE NOTE) field-effect; N-channel; type M9730
R1	6-129753	RESISTOR, fixed: 100 ±10%; 1/4 W
R2	6-185A15	39 ±5%; 1/8 W
W7	1-80760B68	LINE, RF transmission: includes P1, P2 and 30-83794G01
(Used in Mobile radio applications only)		CABLE, RF: coaxial; 4" length required

NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.



FBEPS-6486-C

MECHANICAL PARTS LIST

TLD8421B and TLD8422B RF Preamplifier
TLD8421A and TLD8422A RF Preamplifier PL-1035-G

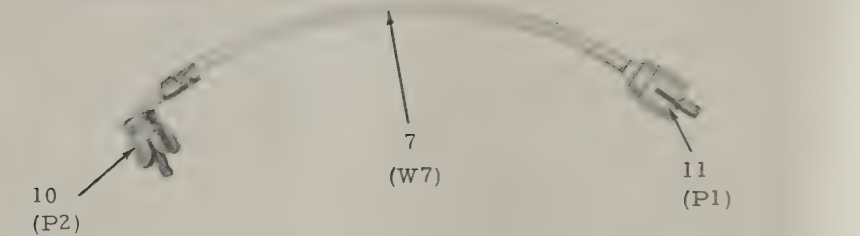
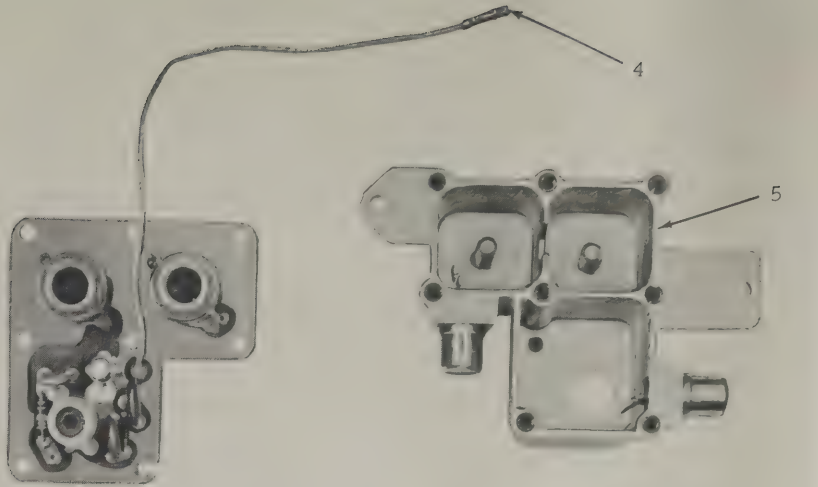
CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S136923	SET SCREW, No. 10-32 x 1"; slotted head; 2 req'd
2	2B83677G01	LOCK NUT: 2 req'd
3	3S134268	LOCKSCREW, tapping: No. 4-40 x 7/16" "Phillips" hex head; 2 req'd
4	39S10184A24	CONNECTOR, receptacle: female
5	15D84416B01	HOUSING, preamplifier
6	3S136926	LOCKSCREW: No. 4-40 x 5/16" "Phillips" hex head; 8 req'd
* 7	1V80760B68	CABLE ASSEMBLY
* 8	14B84192C01	INSULATOR, mylar
* 9	42B84816B01	CLIP, cable
*10	28-82365D03	CONNECTOR, plug; right angle
*11	28-82331G01	CONNECTOR, plug; phono type

* = Used in Mobile Radio applications only

TKN6613A Cable Kit

PL-3205-O

12 (P1)	28-82331G01	CONNECTOR, plug; phono type
13 (P2)	28-82365D03	CONNECTOR, plug; right angle
14 (W7)	30-83794C01	CABLE, coaxial: 13" req'd.



14 (W7)

TKN6613A

12 (P1)

CONNECTS TO RECEIVER

13 (P2)

CONNECTS TO PREAMPLIFIER

Mechanical and Electrical Parts List
Motorola No. PEPS-8813-A
6/20/80-PHI

FAEPS-8814-B

2-RECEIVER COUPLER

MODEL TLN4758A



AEPS-9070-O

the IN connector on the coupler. (If the receiver chassis contains a preamplifier, the output of this module is connected to the IN connector on the coupler.) Coupler cable W4 connects between the R1 coupler connector and the receiver module input connector. One end of coupler cable W5 is bulkhead-mounted in the rear receiver chassis wall and the other end of cable W5 mates with R2 coupler connector. Coupler cable W6 connects between the bulkhead-mounted connector on cable W5 and the input on the second receiver chassis.

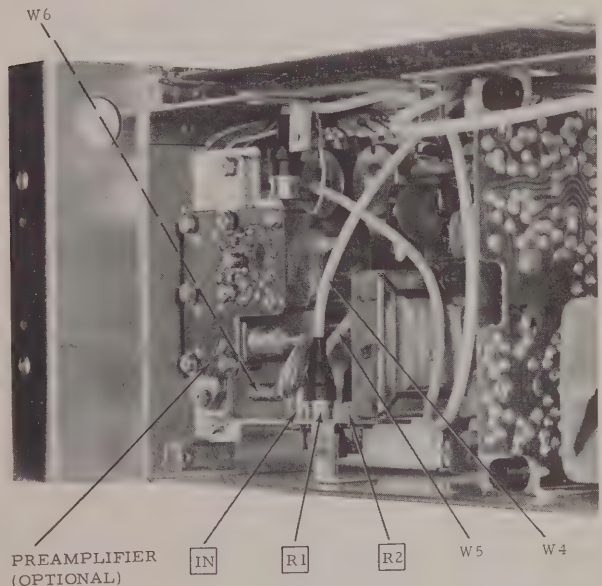
On two-receiver stations with wide separation between frequencies and using the optional preamplifiers, a separate preamplifier is used with each receiver and the antenna coupler connects between the antenna source and the preamplifiers.

1. ELECTRICAL DESCRIPTION

This unit allows two receivers to operate from a single antenna source without interaction. It provides a correct impedance match between both receivers and the antenna source, and also provides isolation between the two receivers. Signal coupling and impedance matching is accomplished by utilizing two transformers and a resistor. A capacitor in the coupler partially cancels the circuit inductance and thereby makes the circuit appear resistive.

2. PHYSICAL DESCRIPTION

The 2-receiver coupler, consisting of a bracket which mounts the electrical components and three cables, is designed to mount in the first receiver chassis. When the coupler is used, the input to the receiver is disconnected and reconnected to



AEPS-9071-O

2-RECEIVER COUPLER

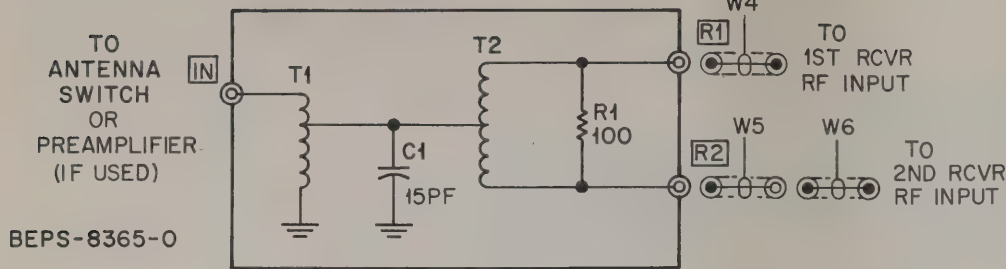


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2-RECEIVER COUPLER

TLN4758A



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN4758A 2-Receiver Coupler

PL-1762-0

C1	21D82785H57	<u>CAPACITOR, fixed:</u> 15pF \pm 0.5pF; 85 \pm V
R1	6P6408	<u>RESISTOR, fixed:</u> 100 \pm 5%; 1/4W
T1 T2	24C84130G02 24C84130G01	<u>TRANSFORMER:</u> rf rf
W4	1V80737B80	<u>CABLE ASSEMBLY:</u> includes: 30B83794C01 CABLE, coaxial; 15" lg. 28B82331G01 CONNECTOR, plug; single contact type; 2 req'd.
W5	1V80737B77	includes: 30B83794C01 CABLE, coaxial; 4" lg. 9A84968D01 CONNECTOR, plug; BNC bulkhead type 28B82331G01 CONNECTOR, plug; single contact type
W6	1V80737B79	includes: 30C84173F01 CABLE, coaxial; 13" lg. 28A84967D01 CONNECTOR, plug; BNC type; 2 req'd.
NON-REFERENCE ITEM		
	1V80737B78	ASSEMBLY, splitter board

2-Receiver Coupler
Schematic Diagram & Parts List
Motorola No. 63P81016E63-0

RECEIVER HARDWARE KITS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5654A Hardware Kit, "PL" Decoder

PL-5093-O

	1-80775B28	BRACKET ASSEMBLY, board guide includes:
	1-80775B27	BRACKET SUBASSEMBLY includes:
	7-82912K01	BRACKET, circuit board
	3-138162	SCREW, tapping: 4-40 x 3/8
	42-84284B01	RETAINER, screw
	1-80775B30	BRACKET ASSEMBLY, mount- ing includes:
	1-80775B29	BRACKET SUBASSEMBLY includes:
	7-82617K01	BRACKET, RH
	3-138162	SCREW, tapping: 4-40 x 3/8"
		2 used
	42-84284B01	RETAINER, screw; 2 used

TLN5903A Shield, Receiver

PL-5040-O

	3-139495	SCREW, machine: 6-20 x 5/16"; 5 used
	26-82677L01	SHIELD, receiver



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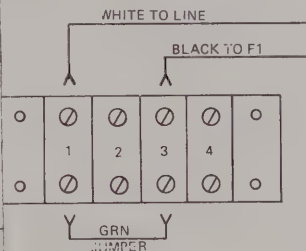
ACTION-

U-1 IS IN ON REMOTE CONTROL MODELS, OUT ON LOCAL CONTROL MODELS.

UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROFARADS, RESISTOR VALUES ARE IN OHMS.

PN1151A - 60 Hz 120 V AC SHOWN)

PN1152A - 50/60 Hz 120, 220, 240 V AC CONNECTIONS AS FOLLOWS).



INSTRUCTIONS FOR 120 V AC: GRN JUMPER FROM TB1-1 TO TB1-4
WHITE LEAD TO TB1-4
BLACK LEAD TO TB1-3

220 V AC: GREEN JUMPER FROM TB1-3 TO TB1-4
WHITE LEAD TO TB1-2
BLACK LEAD NOT USED, REMOVE

240 V AC: GREEN JUMPER FROM TB1-3 TO TB1-4
WHITE TO TB1-1
BLACK NOT USED, REMOVE

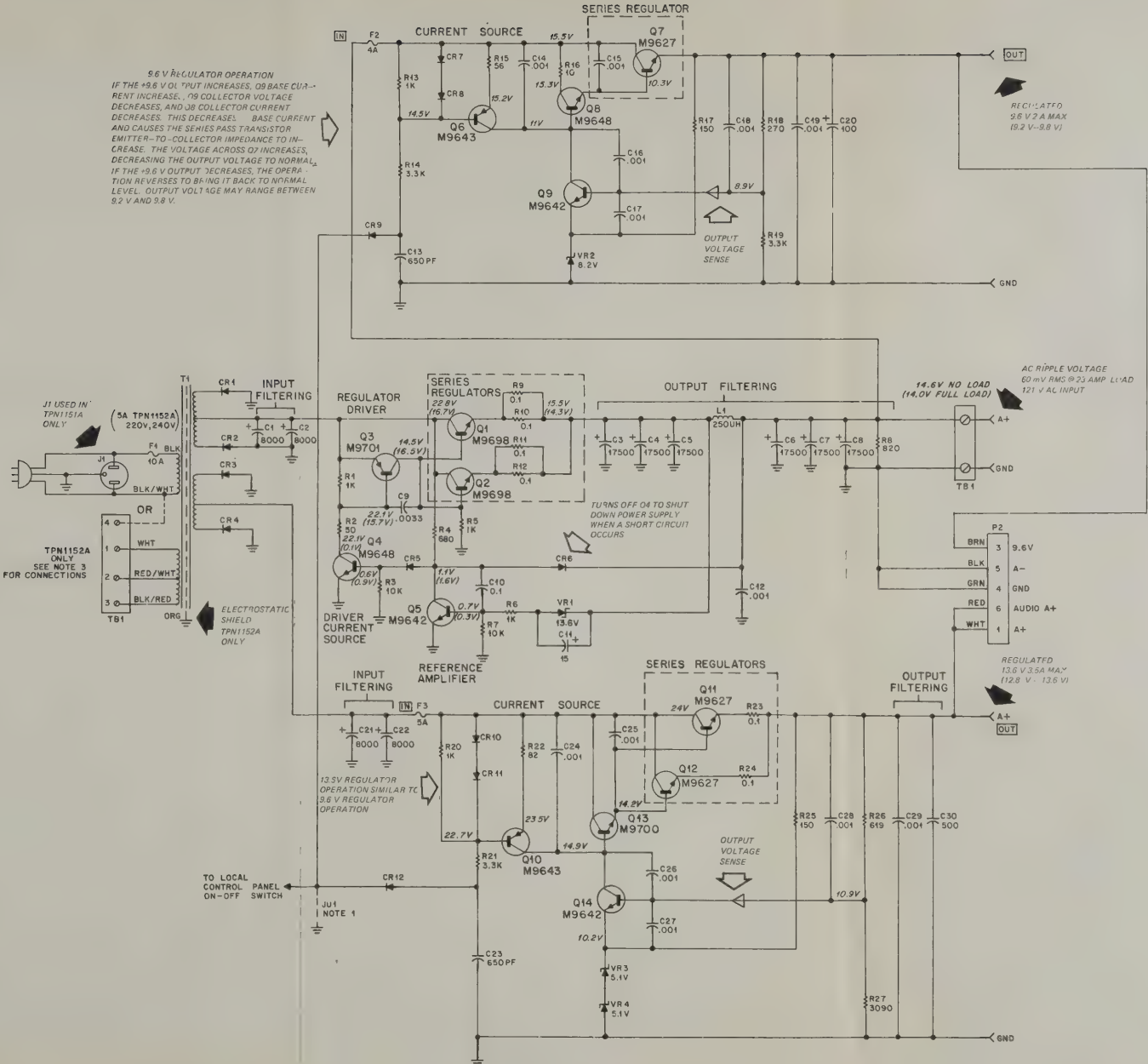
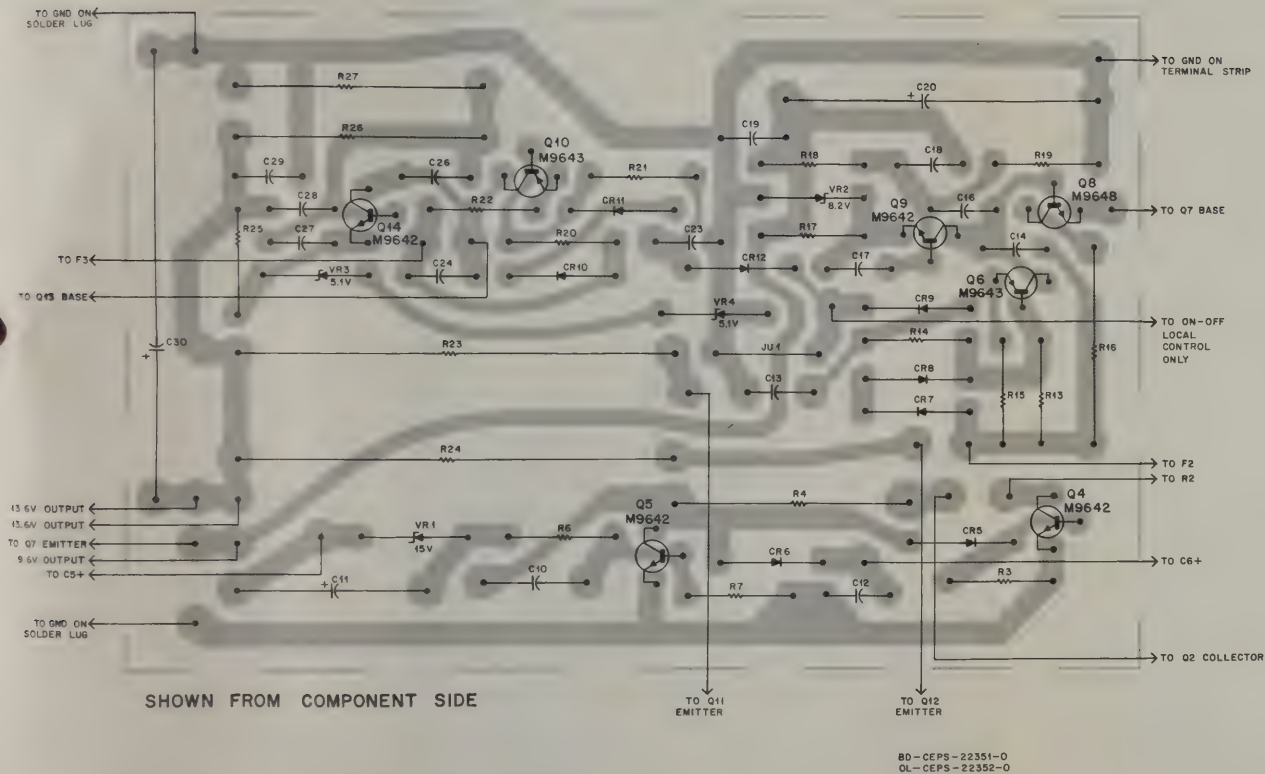
POWER SUPPLY

POWER SUPPLY

MODELS TPN1151A AND TPN1152A

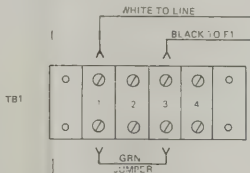
FUNCTION-

Provides regulated 9.6 V dc and two 13.6 V dc outputs from a 120 V, 60 Hz (TPN1151A), or 120, 220, 240 V, 50/60 Hz (TPN1152A) power input. All outputs are automatically adjusted for changes in load or input voltage.



NOTES

- JU-1 IS IN ON REMOTE CONTROL MODELS, OUT ON LOCAL CONTROL MODELS.
- UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROFARADS, RESISTOR VALUES ARE IN OHMS.
- TPN1151A - 60 Hz 120 V AC SHOWN. TPN1152A - 50/60 Hz 120, 220, 240 V AC (CONNECTIONS AS FOLLOWS)

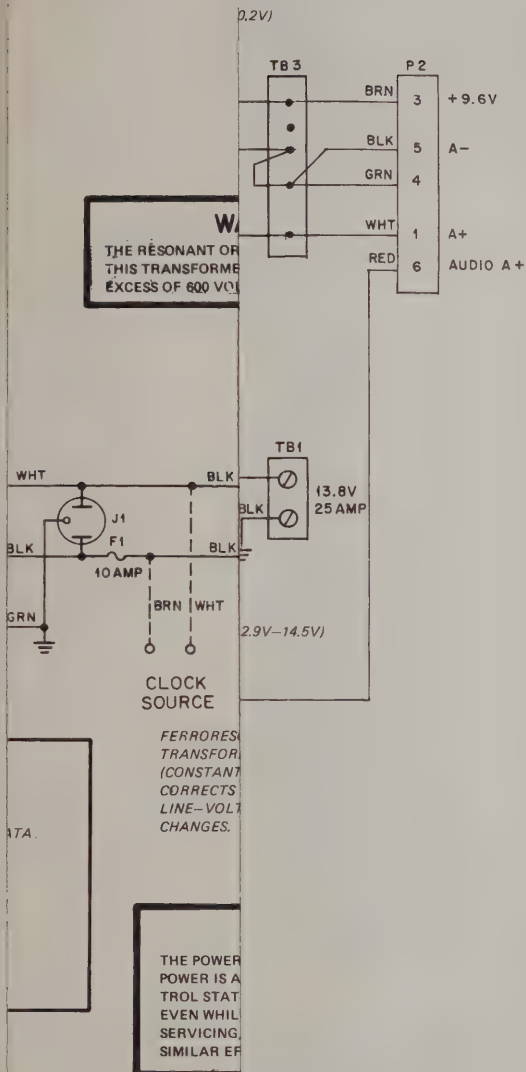


- CONNECTIONS FOR 120 V AC: GRN JUMPER FROM TB1-1 TO TB1-4
WHITE LEAD TO TB1-4
BLACK LEAD TO TB1-3
- 220 V AC: GREEN JUMPER FROM TB1-1 TO TB1-4
WHITE LEAD TO TB1-2
BLACK LEAD NOT USED, REMOVE
- 240 V AC: GREEN JUMPER FROM TB1-3 TO TB1-4
WHITE LEAD TO TB1-1
BLACK LEAD NOT USED, REMOVE

PARTS LIST SHOWN
ON BACK OF THIS PAGE
68P81033E41-E
6/20/80-PHI

POWER SUPPLY

MODELS TPN1110A
TPN1110B



FUNCTION

Provides regulated 9.6 V dc and 13.6 V dc outputs and a 13.8 V dc unregulated output from a 121 V 60 Hz ac power input. 9.6 V and 13.6 V outputs are automatically adjusted for changes in load or input voltage.

on	Cable
	TKN6658A
	TKN6658A

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

68P81020E44-L
6/20/80-PHI

TRN6717A Power Supply Board

PL-5033-C

CAPACITORS: fixed, uF unless otherwise stated	
C10	8-82400G30 0.1; $\pm 10\%$; 50 V
C11	21-83214C02 15; $\pm 20\%$; 20 V
C12	21-82187B14 .001; $\pm 10\%$; 100 V
C13	21-848236 650 pF; $\pm 5\%$; 300 V
C14 thru 19	21-82187B14 .001; $\pm 10\%$; 100 V
C20	23-82401A25 100; $\pm 10\pm 15\%$; 100 V
C23	21-848236 650; $\pm 5\%$; 300 V
C24	21-82187B14 .001; $\pm 10\%$; 100 V
C26 thru 29	21-82187B14 .001; $\pm 10\%$; 100 V
C30	23-83210A23 500-150 $\pm 10\%$; 25 V
DIODES: (SEE NOTE) silicon	
CR5 thru 12	48-83654H01
TRANSISTORS: (SEE NOTE) NPN: type M9648	
C4	48-869648
C6	48-869642
C8	48-869643
C9	48-869648
C10	48-869642
C11	48-869643
PNP: type M9643	
RESISTORS: fixed; $\pm 10\%$, 1/4 W, unless otherwise stated	
R3	6-124C73 10k
R4	6-127C45 680; 2 W
R5	6-124C49 1k
R6	6-124C73 10k
R13	6-124C49 1k
R14	6-124C61 3.3k
R15	6-124C19 56
R16	6-126C01 10
R17	6-124C29 150
R18	6-124A35 270 $\pm 5\%$
R19	6-124C61 3.3k
R21	6-124A61 3.3k $\pm 5\%$
R22	6-124C23 82k
R23, 24	17-82177B50 .1; 7 W
R25	6-124C23 150
R26	6-82672B36 3090 $\pm 1\%$
VOLTAGE REGULATORS: (SEE NOTE)	
VR1	48-82256C65 zener, 13.6 V
VR2	48-83461E32 zener, 8.2 V
VR3, 4	48-83461E23 zener, 5.1 V
MECHANICAL PARTS	
CIRCUIT BOARD, eyeleted includes:	
1-80791B25	STANDOFF
43-84594G01	

NOTE:

For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN6718A Power Supply Chassis (60 Hz)

PL-5034-B

CAPACITORS: fixed; uF unless otherwise stated	
C1, 2	23-83093G13 8000; $\pm 150-10\%$; 35 V
C3 thru 8	23-83093G20 17500; $\pm 150-10\%$; 20 V
C9	21-82428B10 .0033; $\pm 10\%$; 100 V
C21, 22	23-83093G13 8000; $\pm 150-10\%$; 35 V
C25	21-82187B14 .001; $\pm 10\%$; 100 V
DIODES: (SEE NOTE) silicon	
CR1, 2	01-80739B59
CR3, 4	48-82525G13
FUSES: 10A	
F1	65-135105
F2	65-61688
F3	65-52293
COIL: 250 uH	
L1	25-84514G01
TRANSISTORS: (SEE NOTE) NPN: type M9698	
O1, 2	48-869698
O3	48-869701
O7, 11, 12	48-869627
O13	48-869700
PNP: type M9701	
NPN: type M9627	
NPN: type M9700	
RESISTORS: fixed; $\pm 10\%$, unless otherwise stated	
R1	6-125C49 1k; 1/2 W
R2	17-82177B20 50; 7 W
R8	6-124C47 820; 1/2 W
R9 thru 12	17-82177B50 1; 7 W
R20	6-124C49 1k
TRANSFORMER, power	
T1	25-82623L01 120 V AC; 60 Hz (TRN1151) only
primary: BLK-BLK (WHT = .377 ohms)	
secondary: RED-RED = .031 ohms, GRN-RED = .138 ohms	
120 V AC; 50 Hz (TRN1152) only	
primary: WHT-BLK = 1.7 ohms	
secondary: RED-RED = .033 ohms, GRN-GRN = .152 ohms	
MECHANICAL PARTS	
COVER ASSEMBLY includes:	
1-80793B96	COVER, riveted
1-80790B99	includes:
15-82683L01	COVER, power supply
3-136138	SCREW, tapping; #6-32 x 3/8"; 4 used
42-83123P01	RETAINER; 4 used
1-80791B24	HEAT SINK ASSEMBLY includes:
2-7005	NUT, hex; 6-32 x 1/4" x 3/32"; 4 used
3-3398	SCREW, tapping; #6-20 x 3/8"
3-488100	SCREW, machine; 6-32
4-7569	WASHER, flat; .145-.312-.027"; 4 used
4-7650	WASHER, lock; #6 internal; 2 used
4-7666	WASHER, lock; #6 external
4-474216	WASHER, insulated; 4 used
4-84496C01	WASHER, shoulder; 4 used
14-865854	INSULATOR; transistor; 2 used
26-84923B01	HEAT SINK
29-5207	LUG, solder; #6; 2 used
29-84499B01	LUG, transistor; 4 used
42-10217A01	STRAP, cable harness
1-80791B23	CHASSIS, power supply, riveted includes:
4-8242	WASHER, flat; .094-.250-.027"; 4 used
9-84935D01	SOCKET, transistor; 3 used
9-83662A01	SOCKET, transistor; 2 used

REVISIONS

*95=1011F41-E

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6717A-1	R18	FROM 6-124A31, 180 TO 6-124A35, 270	G9 BASE

31-121701	31-121701	TERMINAL, atrip; 5 pin
27-82682L01	27-82682L01	CHASSIS, power supply
2-7005	2-7005	NUT, hex; 6-32 x 1/4 x 3/32"; 4 used (TRN6731A only)
3-135664	3-135664	SCREW, tapping; #6-32 x 9/16"; 4 used (TRN6731A only)
4-7669	4-7669	WASHER, lock; #6 split; 4 used (TRN6731A only)
29-812979	29-812979	LUG, solderless; 4 used (TRN6731A only)
29-847854	29-847854	LUG, slotted tongue; (TRN6718A) 5 used (TRN6731A only)
2-115123	2-115123	NUT, hex; 10-32 x 3/8 x 1/8"; 4 used
2-119913	2-119913	NUT, hex; 8-32 x 11/32 x 1/8"; 2 used
3-2957	3-2957	SCREW, machine; 8-32 x 1/2"; 2 used
3-3360	3-3360	SCREW, tapping; #6-20 x 1/2"; 10 used
3-7184	3-7184	SCREW, machine; 6-32 x 1/2"; 4 used
3-134214	3-134214	SCREW, tapping; #6-32 x 5/8"; 4 used
3-7257	3-7257	SCREW, machine; 8-32 x 5/8"; 4 used
3-134214	3-134214	SCREW, tapping; #6-32 x 5/8"; 4 used
3-136138	3-136138	SCREW, tapping; #6-32 x 3/8"; 2 used
3-136140	3-136140	SCREW, tapping; #8-32 x 5/8"; 2 used
3-138216	3-138216	SCREW, tapping; #10-32 x 3/8"; 4 used
7-82737L01	7-82737L01	BRACKET
9-82083C01	9-82083C01	RECEPTACLE, fuse; 3 used
29-5321	29-5321	LUG, soldering; #10
30-858552	30-858552	CABLE, battery; #12 black; 11 used
30-858553	30-858553	CABLE, battery; #12 red; 11 used
30-83211C01	30-83211C01	AC CORD AND PLUG
9-83238C02	9-83238C02	OUTLET, AC; 3 prong (TRN6718A only)
31-50378	31-50378	TERMINAL, board
31-82272B05	31-82272B05	TERMINAL, board; 4 pin (TRN6731A only)
54-83532H01	54-83532H01	LABEL, caution

NOTE:

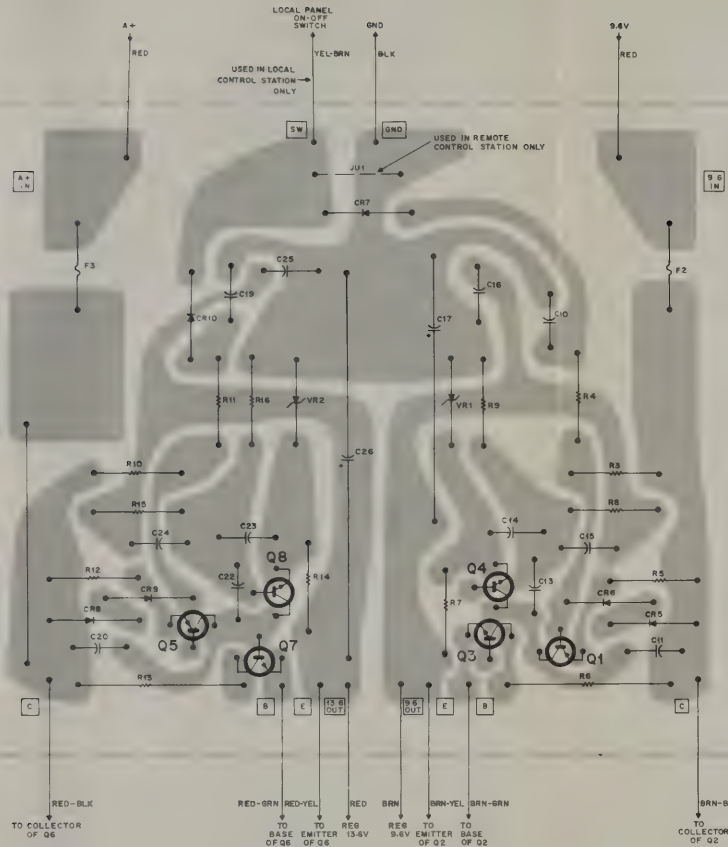
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

POWER SUPPLY

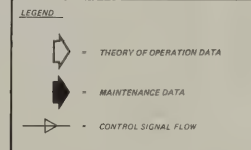
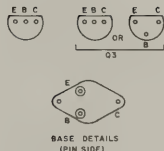
MODELS TPN1110A
TPN1110B

FUNCTION

Provides regulated 9.6 V dc and 13.6 V dc outputs and a 13.8 V dc unregulated output from a 121 V 60 Hz ac power input. 9.6 V and 13.6 V outputs are automatically adjusted for changes in load or input voltage.



SHOWN FROM COMPONENT SIDE
9.6V AND 13.6V REGULATOR BOARD

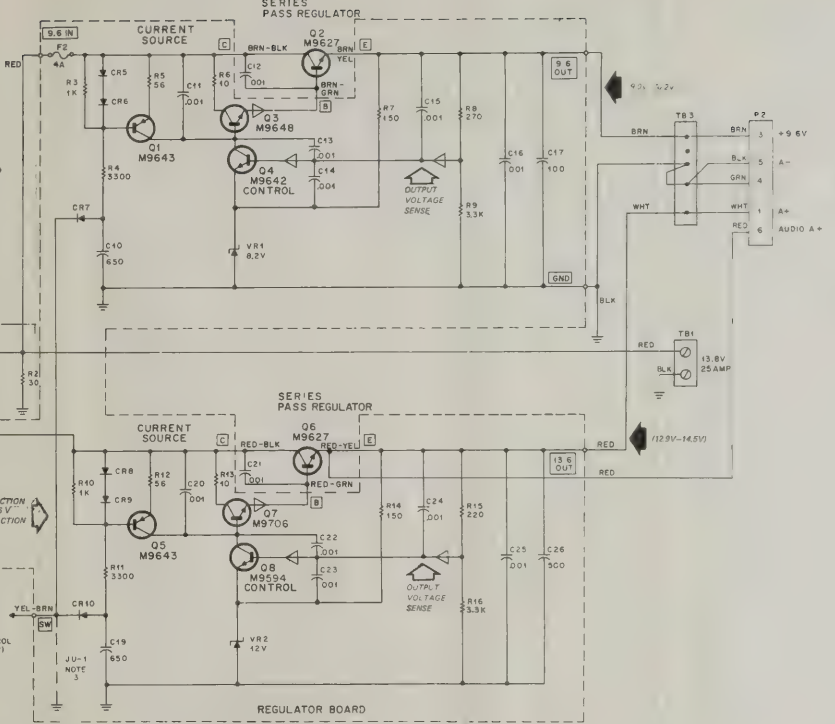


WARNING
THE RESONANT OR INTERMEDIATE WINDING OF THIS TRANSFORMER REACHES VOLTAGES IN EXCESS OF 600 V RMS.

WARNING
THE POWER SUPPLY IS ALWAYS "ON" WHILE INPUT POWER IS APPLIED. WHEN USED WITH LOCAL CONTROL STATIONS, THE 13.8 V 25 AMP CIRCUIT IS ON EVEN WHILE THE ON-OFF SWITCH IS "OFF". FOR SERVICING, PULL LINE CORD (OR PERFORM A SIMILAR EFFECT ACTION).

- NOTE
1. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICRO-FARADS. RESISTOR VALUES ARE IN OHMS.
 2. T82 MOUNTS UNDER OUTLET BOX.
 3. JU1 IS IN ON REMOTE CONTROL MODELS, OUT IN LOCAL CONTROL MODELS.

8.6 V REGULATOR ACTION:
IF THE 8.6 V OUTPUT INCREASES, Q4 BASE CURRENT INCREASES, Q4 COLLECTOR VOLTAGE DECREASES, AND Q3 COLLECTOR CURRENT DECREASES. THIS DECREASES Q2 BASE CURRENT AND CAUSES THE SERIES PASS TRANSISTOR EMITTER-TO-COLLECTOR IMPEDANCE TO INCREASE. THE VOLTAGE ACROSS Q2 INCREASES, DECREASING THE OUTPUT VOLTAGE TO NORMAL. IF THE 8.6 V OUTPUT DECREASES, THE ABOVE ACTION REVERSES TO BRING IT BACK TO NORMAL LEVEL. OUTPUT VOLTAGE MAY RANGE BETWEEN 9.0 V & 10.2 V.



MODEL COMPLEMENT

Model	Version	Chassis & Hardware	Version	Regulator Board	Version	Cable
TPN1110A		TLN5123A		TLN5122A	1	TKN6658A
TPN1110B		TLN5123B		TLN5122A	1	TKN6658A

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5122A Power Supply Board PL-2420-A

C10	21-84823n	CAPACITOR, fixed uF $\pm 10\%$, 100 V unless otherwise stated
C11	21-82187B20	650 pF $\pm 5\%$, 300 V
C13 thru 1b	21-82187B20	.001
C17	23-82601A25	100 $\cdot 10 \cdot 150\%$, 20 V
C19	21-84823n	650 pF $\pm 5\%$, 300 V
C20	21-82187B20	.001
C22 thru 25	21-82187B20	.001
C26	23-83210A19	500 $\cdot 10 \cdot 100\%$, 20 V
CR5 thru 10	48-83c54H01	SEMICONDUCTOR DEVICE, diode (SEE NOTE), Silicon
Q1	48-869643	TRANSISTOR (SEE NOTE), PNP, type M9643
Q3	48-869648	NPN, type M9648
Q4	48-869642	NPN, type M9642
Q5	48-869643	PNP, type M9643
Q7	48-869706	NPN, type M9706
Q8	48-869594	NPN, type M9594
R1	6-10401C49	RESISTOR, fixed $\pm 10\%$, 1/4 W unless otherwise stated
R4	6-10401C41	1k
R5	6-10401C19	3, 3k
R6	6-488022	56
R7	6-10401C29	10, 1 W
R8	6-10401A35	150
R9	6-10401A61	270 $\pm 5\%$
R10	6-10401C49	3, 3k $\pm 5\%$
R11	6-10401C61	1k
R12	6-10401C19	3, 3k
R13	6-488022	56
R14	6-10401C29	10, 1 W
R15	6-10401A33	150
R16	6-10401A61	220 $\pm 5\%$
		3, 3k $\pm 5\%$
VR1	48-8225bC08	SEMICONDUCTOR DEVICE, (SEE NOTE), Zener, 8.2 V
VR2	48-8225bC25	Zener, 12 V
NON-REFERENCED ITEM		
	42-82690A01	CLIP, fuse, 4 req'd.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN5123B Chassis and Hardware Kit (P/O TPN110B)
TLN5123A Chassis and Hardware Kit (P/O TPN110A) PL-4417-F

C1	8-82705M01	CAPACITOR, fixed uF $\pm 10\%$, 100 V unless otherwise stated
C2 thru 9	23-83093C20	6: 660 V
C12	21-82187B14	17, 500 $\cdot 150 \cdot 10\%$, 20 V
C18	23-82304B16	.001
C21	21-82187B14	5000 $\cdot 10 \cdot 150\%$, 35 V
		.001
CR1, 2	1-80739B57	SEMICONDUCTOR DEVICE, diode (SEE NOTE)
CR3, 4	48-82525C13	Assembly, silicon silicon
F1	65-138179	FUSE, cartridge
F2, 3	65-61688	10 A, 125 V
		4A, 250 V
J1	9-83238C01	CONNECTOR, receptacle
		3 prong
L1, 2	25-84514G01	CHOKES, filter
		250 uH
Q2	48-869627	TRANSISTOR (SEE NOTE)
Q6	48-869627	NPN, type M9627
		NPN, type M9627
R1, 2	17-83389C02	RESISTOR, fixed
		30 $\pm 5\%$, 20 W
T1	25-84516G01	TRANSFORMER, power
		primary windings 1 & 2: 3
		secondary windings 3 & 5 with 4 center tap, 6 & 8 with 7 center tap, and 9 & 10
NON-REFERENCED ITEMS		
	14-865854	INSULATOR, transistor: 2 req'd
	5-84512G01	GROMMET: 4 req'd.
	9-82083C01	FUSEHOLDER, extractor
		post type
	14-84548A01	INSULATOR, diode: 2 req'd.
	37-107234	GROMMET, rubber
	9-84935D01	SOCKET, transistor: 2 req'd.
	64-83562D01	HEAT SINK: 2 req'd.
	30-83211C01	AC LINE CORD: includes molded plug (PI)
	14-82975K01	INSULATOR

TKN6658A Cable Kit PL-2421-A

P2	9-84151B01	CONTACT, receptacle: 5 req'd.
	14-84590B01	INSULATOR, connector
	42-10217A02	STAP, cable: 6 req'd.

NOTE

For optimum performance, diode and transistor replacement parts must be ordered by Motorola part number only.

REVISIONS

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN5122A-1	Q7	FROM 48-869648, 310-48 TO 48-869706, 310706	13.0 V SERIES REGULATOR
	Q8	FROM 48-869642, 310-42 TO 48-869594, 310594	

RF INTERCABLING

INTERMITTENT DUTY STATIONS WITH UNIFIED CONTROL CHASSIS

REF. DESIG.	RF CABLE DESCRIPTION		PART OF
	PART NO.		
W1	1-80797B41		TKN6936A
W2	1-80797B42		TKN6936A
W101	-		TKN6570A
W7	-		TKN6613A
W4	1-80737B80		TLN4758A
W5	1-80737B77		TLN4758A
W6	1-80737B79		TLN4758A
W601	-		TKN6569A

EPS-24360-A

NOTES:

1. Cable W7 is a TKN6613A RF Preamplifier Cable Kit which is parts listed in the RF Preamplifier Section of this manual.
2. Cables W4, W5, and W6 are part of TLN4758A Two-Receiver Coupler which are parts listed in the Two-Receiver Coupler Section of this manual.

EPS-22903-O

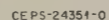
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PARTS LIST SHOWN ON
BACK OF THIS SHEET

INTERMITTENT DUTY STATIONS WITH UNIFIED CONTROL CHASSIS



- NOTES:
1. REFER TO DETAIL A FOR RECEIVER RF CONNECTIONS IN TWO-RECEIVER STATIONS.
 2. REFER TO (WITHOUT PREAMPLIFIER) DETAIL B FOR RECEIVER NO. 1 RF CONNECTIONS IF PREAMPLIFIER IS NOT USED.
 3. TWO-RECEIVER STATIONS WITH WIDELY SEPARATED FREQUENCIES AND OPTIONAL PREAMPLIFIER USE A PREAMPLIFIER WITH EACH RECEIVER. ANTENNA CONNECTS TO TWO-RECEIVER COUPLER. TWO OUTPUTS OF COUPLER CONNECT TO PREAMPLIFIERS.

RF CABLE REQUIREMENTS
FOR
INTERMITTENT DUTY STATIONS
WITH UNIFIED CHASSIS
(132-174 MHz)

EPS-24360-A

NOTES:

1. Cable W7 is a TKN6613A RF Preamplifier Cable Kit which is parts listed in the RF Preamplifier Section of this manual.
2. Cables W4, W5, and W6 are part of TLN4758A Two-Receiver Coupler which are parts listed in the Two-Receiver Coupler Section of this manual.

EPS-22903-O

RF INTERCABLING

PARTS LIST SHOWN ON
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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TKN6936A RF Cable Kit, Transmitter

PL-5515-O

W1	1-80797B41	<u>CABLE ASSEMBLY</u>
P1	28-84282D01	includes:
P2	28-84967D01	CONNECTOR, plug: phono
	30-84173E01	CONNECTOR, plug: BNC type
W2	1-80797B42	CABLE, coaxial: 24-1/2" used
P3	28-84282D01	includes:
P4	28-84967D01	CONNECTOR, plug: phono
	30-84173E01	CONNECTOR, BNC type
		CABLE, coaxial: 9-1/2" used
NON-REFERENCED ITEMS		
	1-80793B01	LEAD & LUG ASSEMBLY, Antenna Relay Control
		includes:
	39-10184A24	CONTACT, female: 2 used
	37-82603D60	SLEEVE, numbered: 2 used
	42-10217A02	STRAP, cable harness; 2 used
	29-82010D01	TERMINAL, female: 2 used
	1-80797B40	LEAD & LUG ASSEMBLY, Power includes:
	29-824151	LUG, slotted tongue: 2 used
	29-10210A10	TERMINAL, crimp: #6, (yellow)
	30-813233	CABLE, battery: #10 (red); 33" used
	30-831572	CABLE, battery: #10 (black); 32" used
	3-134212	SCREW, tapping: 4-40 x 5/16"; 2 used
	3-136934	SCREW, tapping: 6-32 x 3/8"; 2 used
	7-82674L01	BRACKET, relay mounting

TKN6569A RF Cable, Transmitter (W601)

PL-5514-O

	28-82365D03	CONNECTOR, plug: single contact
	9-84968D01	CONNECTOR, plug: BNC bulk- head type
	30-83794C01	CABLE, coaxial: 5" used

TKN6570A Cable Assembly Receiver (W101) PL-5144-O

J103	9-84968D01	CONNECTOR, plug:
P101	28-82331G01	BNC bulkhead type single contact
NON-REFERENCED ITEM		
	30-83794C01	CABLE, coaxial: 17" lg.

